National Assessment of Student Achievement 2022

MAIN REPORT

National Assessment of Student Achievement in Mathematics, Science and Technology, Nepali and English for Grade 5

Government of Nepal
Ministry of Education, Science & Technology
Education Review Office (ERO)
Sanothimi, Bhaktapur, Nepal

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National Assessment of Student Achievement in Mathematics, Science and Technology, Nepali and English for Grade 5

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Suggested Citation: Education Review Office. (2025). *National assessment of student achievement 2022: Main report – Grade 5 (Mathematics, Science and Technology, Nepali, and English)*. https://www.ero.gov.np/

FOREWORD

The National Assessment of Student Achievement (NASA) evaluates the learning achievement of students and recommends strategies for enhancing education. This assessment provides crucial evidence to policymakers, enabling them to create practical and implementable educational policies at both national and sub-national levels, thereby driving the necessary educational reforms. NASA is a curriculum-based, large-scale systematic assessment that measures student learning outcomes using standardized tools.

The fourth cycle report for grade five, part of twelve large-scale national assessments by the Education Review Office, covers Mathematics, Science and Technology, Nepali and English. Previous assessments were conducted in 2012, 2015, and 2018. The 2022 report is based on responses from a representative sample of 34,170 students across 1,800 schools in Nepal, with an equal number of students and schools for each subject, considering seven provinces. Standardized test booklets, developed in line with Nepal's National Curriculum, were used. Data analysis included overall mean scores, proficiency levels, and the relationship between achievement scores and various factors, using Item Response Theory (IRT) and linking items. Comparative results with NASA 2018 are presented for Mathematics and Nepali, while Science and English results are not comparable due to the absence of 2018 assessments. The results provide generalized evidence of learning levels across the defined population.

I would like to acknowledge the invaluable contributions of teachers, experts, subject committee members, and researchers in the development of the framework and tools, test administration, data analysis, and report writing. My sincere thanks go to the MoEST and different organizations for their support in the report development process. I extend my gratitude to the Director of NASA unit Narayan Prasad Jha, other directors and ERO staff for their involvement in various phases of this assessment. Similarly, I appreciate Dr. Hari Lamsal, Deepak Sharma, Baikuntha Aryal, and other distinguished personalities for their valuable comments on the report. I am indebted to the contributions of former Director General Chandra Kanta Bhusal, Central Level Agencies, and the Ministry of Education, Science and Technology for their support in budgeting, monitoring test administration, and tool development. My sincere gratitude also goes to the ministers of Education Science and Technology (MoEST) Hon. Sumana Shrestha and Hon. Bidya Bhattarai and Secretary of MoEST Dr. Dipak Kafle for their valuable suggestions and guidance. I believe this report will be a milestone for policymakers, program designers, teachers, educators, researchers, and other stakeholders in improving students' learning and will serve as a foundation for enhancing the quality of education at the school level in Nepal.

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ACRONYMS

CEHRD:	Centre for Education and Human Resource Development
CI:	Confidence Interval
CR:	Constructed Response
CRT:	Criteria-Referenced Test
CSS:	Clustered Sample Size
CTT:	Classical Test Theory
DIF	Differential Item Functioning
DPL:	Defining Proficiency Level
EDCU:	Education Development and Coordination Unit
EMIS:	Education Management Information System
ERO:	Education Review Office
GPCM:	Generalized Partial Credit Model
ICC:	Item Characteristic Curve
ID:	Identification
IEA:	International Association for the Evaluation of Educational Achievement
IRT:	Item Response Theory
LAF:	Language Assessment Framework
MCQ:	Multiple-Choice Questions
MoEST:	Ministry of Education, Science and Technology
MoS:	Measure of Size
N cases	Number of Cases/Students in the Population
NASA:	National Assessment of Student Achievement
NEB:	National Examinations Board
NRT:	Norm-Referenced Test
OECD:	Organization for Economic Co-operation and Development
PCM:	Partial Credit Model
PISA:	Programme for International Student Assessment

PPS:	Probability Proportionate to Size
PV:	Plausible Value
SE:	Standard Error
SES:	Socio-Economic Status
SPSS:	Statistical Package for Social Science
SR:	Selected Response
SRS:	Simple Random Sampling
SSDP:	School Sector Development Plan
SSRP:	School Sector Reform Plan
TAM:	Test Analysis Module
TIF:	Test Information Function
TIMSS:	Trends in International Mathematics and Science Study
TPD:	Teacher Professional Development
VIF	Variance Inflation Factor
WLE	Weighted Likelihood Estimation

EXECUTIVE SUMMARY

The Education Review Office (ERO), established in 2010, serves as an independent body responsible for auditing the performance of schools and institutions under the Ministry of Education, Science and Technology (MOEST) system. Its primary mission is to evaluate student achievement levels, thereby fostering institutional accountability and striving to enhance the overall quality of education.

The main activity of ERO incorporates an evaluation and providing feedback. It provides well-informed recommendations to the government and various stakeholders based on comprehensive findings from the National Assessment of Student Achievement (NASA), performance audits, and in-depth research on educational issues. These activities are designed to ensure that educational institutions are held to high standards and are continuously improving.

Since 2012, ERO has been conducting nationwide assessments to measure the academic performance of grade five students. These assessments are crucial for understanding how well students are performing in key subject areas and identifying areas that need improvement.

The NASA 2022 assessment specifically aimed to determine the achievement levels of grade five students in Mathematics, Science, Nepali, and English. This assessment took into consideration a variety of factors, including personal, family, and school-related influences, to provide a holistic view of student performance. By analyzing these factors, NASA seeks to identify the key elements that impact student achievement and offer actionable feedback to educators, schools, curriculum developers, policymakers, and program implementers. This feedback is intended to drive necessary reforms and improvements in the education system, ensuring that all students have the opportunity to succeed.

The primary objective of the NASA is to provide accurate and reliable insights into the learning achievements of grade five students. These insights serve as valuable feedback for the Ministry of Education, Science, and Technology (MoEST) in shaping effective educational policies.

To achieve this goal, the Education Review Office (ERO) conducted a comprehensive nationwide assessment in 2022. This assessment evaluated the academic performance of grade five students in Mathematics, Science, Nepali, and English using standardized tests that were carefully aligned with the national curriculum. The assessment covered 75 out of 77 districts, excluding Manang and Mustang due to their lower student populations. A total of 34,170 students from 1,800 schools participated in this extensive evaluation.

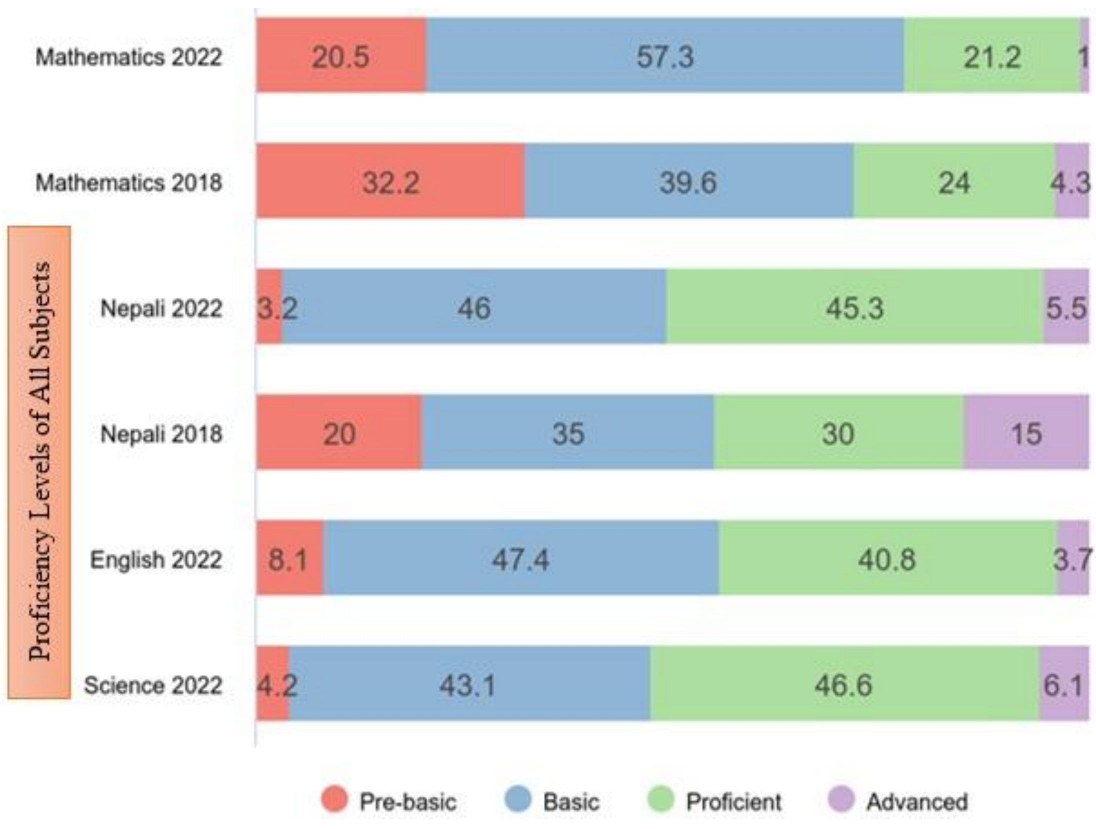
The achievement scores for Mathematics and Nepali were calibrated with the scores from NASA 2018 to ensure consistency and comparability. For Science and English, the national achievement score was set at 500, as there was no national assessment conducted in 2018 for these subjects.

The results of the assessment were analyzed using both descriptive statistics (mean and standard deviation) and inferential statistics (independent sample t-test, ANOVA, and multiple linear regression). Various graphs were used to illustrate the achievement scores and the frequency of different variables, providing a clear and comprehensive picture of student performance across the country.

In summary, Assessment offers critical data that informs MoEST's policymaking, helping to identify areas of strength and opportunities for improvement in the education system. This, in turn, supports the goal of enhancing the quality of education for all students.

The findings reveal a significant learning loss in Mathematics and Nepali, with scores dropping by 15.4 and 1.1 points respectively compared to the NASA 2018 results. For Science and English, the national achievement score was established at 500 due to the absence of previous national assessments in these subjects.

Most students demonstrated proficiency levels categorized as basic and proficient, with over 90% of students achieving these levels in Science, Nepali, and English, and around 80% in Mathematics.



Students from the Bagmati, Gandaki, and Koshi provinces achieved higher scores, while those from the Karnali, Sudurpaschim, and Madhesh provinces scored lower across all subjects. Boys, students from municipalities, and those attending institutional schools outperformed girls, students from rural municipalities, and community-school attendees. institutional schools outperformed community schools in all subjects, and students from nuclear families scored higher than those from joint families.

Brahmin/Chhetri students had higher achievement scores, whereas Dalit students scored lower in all subjects. Terai (Madhesi) students excelled in Mathematics and Science, while Mountain (Pahadi) students performed better in Nepali and English. Students who spoke Nepali at home outperformed those who spoke other languages in all subjects.

Shorter travel times to school generally correlated with higher achievement scores in all four subjects: Mathematics, Science, Nepali, and English. Students taught in local languages scored higher in Mathematics, while those taught in English-medium schools excelled in science.

Moderate engagement in study/homework (more than 2 hours) and limited time (1-4 hours) spent using digital resources led to better academic performance. Students who engaged in group work during leisure time and occasionally participated in extracurricular activities (ECA) scored higher in Mathematics and Science, while regular ECA participants excelled in Nepali and English.

There was a significant positive correlation between parents' education levels and students' achievement across all subjects. Students whose parents were teachers achieved the highest scores, while those whose parents were labours, scored lower. Fathers in higher-achieving jobs also correlated with better student performance, particularly in Nepali.

Students without study support scored highest in Mathematics and Nepali, while those receiving support from their mothers excelled in Science and English. Access to home facilities like a dedicated study space, computers, and internet significantly improved scores in all subjects.

Students with positive attitudes towards teachers, school, subjects, and the school environment performed better in all subjects. However, students facing bullying at school had poorer results, with up to one-third still experiencing various forms of bullying.

The findings of NASA 2022 for Grade Five are pivotal for provincial and local governments in crafting effective education quality improvement plans. Provinces with lower performance, such as Karnali, Sudurpaschim, and Madhesh, are encouraged to adopt the best practices from higher-performing provinces like Bagmati and Gandaki. Similarly, rural municipalities should look to urban municipalities for successful strategies.

The report also highlights the need for the ERO and other research organizations to identify gaps in instructional practices between institutional and community schools. Despite receiving financial support, textbooks, and scholarships, community schools continue to underperform, even though teachers often prefer these schools. This suggests a deeper issue that needs addressing.

Parental education plays a significant role in student achievement scores. However, up to one-third of parents are either illiterate or only literate. Students with parents in teaching professions tend to perform better, indicating a need for the government to elevate the status of the teaching profession.

Students who use digital resources for 1-4 hours show better academic results, suggesting that guardians should manage this behavior to enhance learning. Higher study time and collaborative learning positively impact achievement, indicating that schools and teachers should focus more on developing collaborative, peer, self, and project-based learning environments.

Several factors negatively impact academic performance, including the distance to school, time spent on work for wages and household chores, and bullying. Despite these challenges, up to one-third of students still travel more than an hour to school, less than one-fifth are engaged in work or household chores, and around one-third face bullying. To address these issues, it is essential to establish more schools or hostels, create local plans to reduce students' work and household chores, and implement guidance, counseling, and social awareness programs to control bullying in schools and classrooms.

The findings of this research are limited to certain variables related to students, their parents, and schools. Future studies could explore additional factors such as the use of digital resources for individual and classroom learning and the related competencies of students and teachers. Likewise, social, emotional, and cognitive behavior/status of students might be the areas of exploration. Moreover, program interventions from the government and other organizations, student health, previous learning status, and similar factors were not included in the research instrument. Therefore, further studies should incorporate these variables to identify additional factors that may affect learning performance.

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CHAPTER ONE

National Assessment of Student Achievement: 2022

Background

Assessment is an ongoing process in education, involving the evaluation of competencies and learning outcomes within the curriculum. It is an essential component of teaching and learning activities, as it determines whether educational objectives are being met or not. There are two main types of assessment: formative (or internal) and summative (or external).

Formative assessment plays a vital role in the learning process by providing ongoing feedback to students, helping them identify areas for improvement and encouraging their development. On the other hand, summative assessment evaluates the overall effectiveness of educational programs and the extent to which curricular learning outcomes have been achieved. This type of assessment is often used for certification and student promotion.

However, this report focuses on the national assessment, which is designed for students and schools. Its primary aim is to generate policy recommendations for the education system.

The Education Review Office (ERO), established in 2010, is responsible for auditing the performance of schools and institutions. ERO also assesses student achievement to enhance institutional accountability and improve education quality. In 2022, ERO conducted a nationwide representative sample-based assessment NASA to evaluate the academic performance of grade five students in Mathematics, Science and Technology, Nepali, and English.

The National Assessment of Student Achievement (NASA) provides valuable insights into student learning outcomes, offering feedback to MOEST for policymaking. NASA aims to deliver actionable feedback to teachers, schools, curriculum developers, policymakers, and program implementers, facilitating necessary reforms. Through its recurring cycle, NASA generates evidence-based data on student learning trends and contextual factors, informing the review and development of educational policies and programs.

The assessment utilized standardized tests aligned with the curriculum to evaluate student achievement in four subjects at the national level. The report presents a comparative analysis of these achievements, disaggregated by variables such as province, local governance, school type, gender, ethnicity, and language. Conducted in 75 out of 77 districts, with Manang and Mustang excluded due to lower student populations, the assessment included 1,800 schools selected from a sampling frame of 15,353 schools.

National Assessment of Student Achievement

National Assessment of Student Achievement (NASA) is Large-scale assessment in education. It is an essential tool for collecting comprehensive data on various aspects such as content, individual characteristics, school administration, teacher activities, timing, and scoring across extensive samples or multiple clusters. Traditionally, these assessments have been sample-based, but there has been a notable shift towards census-based approaches in recent decades (Verger et al., 2018).

The assessment, conducted in schools or households, may not always align perfectly with the curriculum. While teachers and schools have a vested interest in the outcomes, the stakes for test-takers are typically low (UNESCO, 2009). The primary goal of these assessments, whether international, regional, or national, is to provide evidence-based information to help policymakers and stakeholders diagnose the performance of educational systems and identify contributing factors. Many large-scale assessments also gather background information to contextualize the results. They are based on predefined standards or learning goals and can be administered to all students in the target grade (census-based) or a representative sample (sample-based), requiring all participants to answer the same standardized questions (Clarke, 2011).

National assessments focus on documenting and evaluating the quality of student learning outcomes produced by schools. Unlike public (external) examinations, which concentrate on individual students' achievements and their selection for further education, national assessments provide a broader overview. The information gathered can supplement data on educational inputs, such as resources or teacher qualifications, and processes. This comprehensive data offers policymakers and education managers evidence of their system's achievements, constraints, and problems, forming a basis for remedial action (Postlethwaite & Kellaghan, 2008). Given the difficulty of planning improvements without such information, national assessments are essential for the professional administration of any education system.

In the 1970s and 1980s, several industrialized countries established systems for conducting national assessments. By the early 1990s, many other countries, including developing nations, began to recognize the importance of regular national assessments. This growing awareness was significantly influenced by the final declaration of the World Conference on Education for All, held in Jomtien, Thailand, in March 1990. The declaration emphasized that access to education is meaningful only if students gain useful knowledge, reasoning abilities, skills, and values. The Dakar Framework for Action in 2000, marking the ten-year follow-up to Jomtien, reinforced this message and highlighted the necessity of clearly defining and accurately assessing learning outcomes (including knowledge, skills, attitudes, and values) to ensure quality education for all.

According to Husén (1987), national assessments have significant implications for various areas. These include social and economic policy, particularly regarding the overall quality and performance of the education system and its role in achieving social and economic objectives, such as equality of opportunity, gender parity, and improving the performance of students from disadvantaged backgrounds. They also impact the organization and management of the education system, including the provision of public and private education. National assessment influences learning conditions, such as instructional time, resources, teacher education, and family support.

In Nepal, NASA serves as a vital tool for evaluating curriculum achievement and identifying gaps between the planned and executed curriculum, similar to international assessments like PISA, TIMMS, and PIRLS. This role is crucial in shaping policy decisions, particularly regarding resource distribution (EDSC, 2008). The NASA report provides policymakers with data on textbook availability, class sizes, and teacher training duration, establishing its status as a globally recognized method for systematically assessing learning outcomes and guiding policy formulation (EDSC, 2008; ERO, 2013; ERO, 2019).

Evolution of NASA in Nepal

Assessment practices in Nepal began to take shape in the late 1980s. However, it wasn't until 1995 that the Ministry of Education formally launched the National Assessment, which operated on a small scale until 2010. Since 2011, the Ministry of Education has administered the large-scale National Assessment of Student Achievement (NASA).

Under the School Sector Reform Plan (SSRP), four cycles of NASA were completed. Following this, five cycles, including NASA 2022, have been conducted under the School Sector Development Plan (SSDP) (Table 1). In both plans, NASA is recognized as a crucial tool for evaluating the quality of education and holding educational institutions accountable for achieving educational objectives.

NASA studies serve both reflective and predictive purposes. Reflectively, they aim to build a comprehensive database for analyzing the strengths and weaknesses of educational policies and practices that impact student learning outcomes (ERO, 2018, 2019). Predictively, they provide insights that can guide future educational reforms and improvements.

The evolution of assessment practices in Nepal, from their inception in the late 1980s to the formal establishment of the National Assessment in 1995, and its subsequent expansion into the large-scale NASA program. It highlights NASA's role in evaluating educational quality and ensuring accountability within the education sector, thereby contributing to the analysis and improvement of educational policies and practices.

Table 1. NASA and NARN conducted by ERO

SSRP				**SSDP**				
2011	**2012**	**2013**	**2015**	**2017**	**2018**	**2019**	**2020**	**2022**
Grade 8	Grades 3 and 5	Grade 8	Grades 3 and 5	Grade 8	Grade 5	Grade 10	Grades 3 and 8	Grade 5

A full cycle of the National Assessment of Student Achievement (NASA) typically spans three years, with each year dedicated to specific tasks. Throughout this cycle, various activities are undertaken, including developing test items, conducting pre-tests, finalizing test items, administering the final tests, analyzing data, writing reports, holding feedback workshops, and disseminating reports that incorporate the feedback received. The NASA report highlights factors affecting student achievement and, based on these findings, provides recommendations for policymaking. This structured approach ensures that each phase of the assessment is thorough and contributes to a comprehensive understanding of educational outcomes, ultimately guiding improvements in the education system.

The Education Review Office (ERO) adheres to internationally recognized standards for conducting national assessments, acknowledging that while circumstances may vary across countries, common practices are observed in most national assessment programs (ERO, 2019). Drawing from a comprehensive examination of global practices, the ERO has adopted specific procedures to ensure effectiveness and consistency. Operating within the Ministry of Education, Science, and Technology (MoEST) system, the ERO holds sole responsibility for conducting national assessments. It collaborates with key stakeholders, including subject experts, teachers, and policymakers, to develop and periodically review assessment policies and frameworks. The MoEST determines the grade level and specifies the subject areas to be assessed, such as literacy, numeracy, Science and Technology, Mathematics, or English. The NASA assessments focus on cognitive skills aligned with the curriculum, designing test items, developing supporting questionnaires, and creating manuals for test administration.

Assessment process

ERO undertakes several essential tasks to ensure the effectiveness and integrity of the assessment process:

Piloting Test Items: ERO conducts pilot tests to refine assessment items. This process involves incorporating feedback from external experts to evaluate the validity, appropriateness, and sensitivity of the items to factors such as gender, ethnicity, geography, and culture.

Reliability and Validity: ERO utilizes pilot item analysis to confirm that the assessment instruments are both reliable and valid, ensuring consistent and accurate measurement of student performance.

Sample Selection and Communication: ERO selects sample schools for the assessment, coordinates the printing of test papers and materials, and communicates with schools and teachers to ensure smooth test administration.

Orienting Test Administrators: ERO provides comprehensive training and guidance to test administrators, including focal persons, supervisors, and administrators. This step ensures that the administration of tests and surveys in selected schools is conducted efficiently and uniformly.

Data Collection and Analysis: ERO collects test scores and relevant data from the assessments, performs data cleaning to ensure accuracy, and conducts thorough data analysis to derive meaningful insights.

Drafting Reports: ERO prepares draft reports based on the data analysis. These drafts are then reviewed by subject committees and external experts to ensure accuracy and comprehensiveness.

Dissemination: ERO shares the final reports through various channels, including publications and mass media, to reach a wide audience.

Policy Feedback: The final reports are reviewed by the Ministry of Education, Science, and Technology (MoEST), the implementing agency, and other stakeholders. This review process helps identify key areas for policy reforms and improvements in the education system in Nepal.

This structured approach ensures a comprehensive and reliable assessment process, ultimately guiding improvements in educational quality.

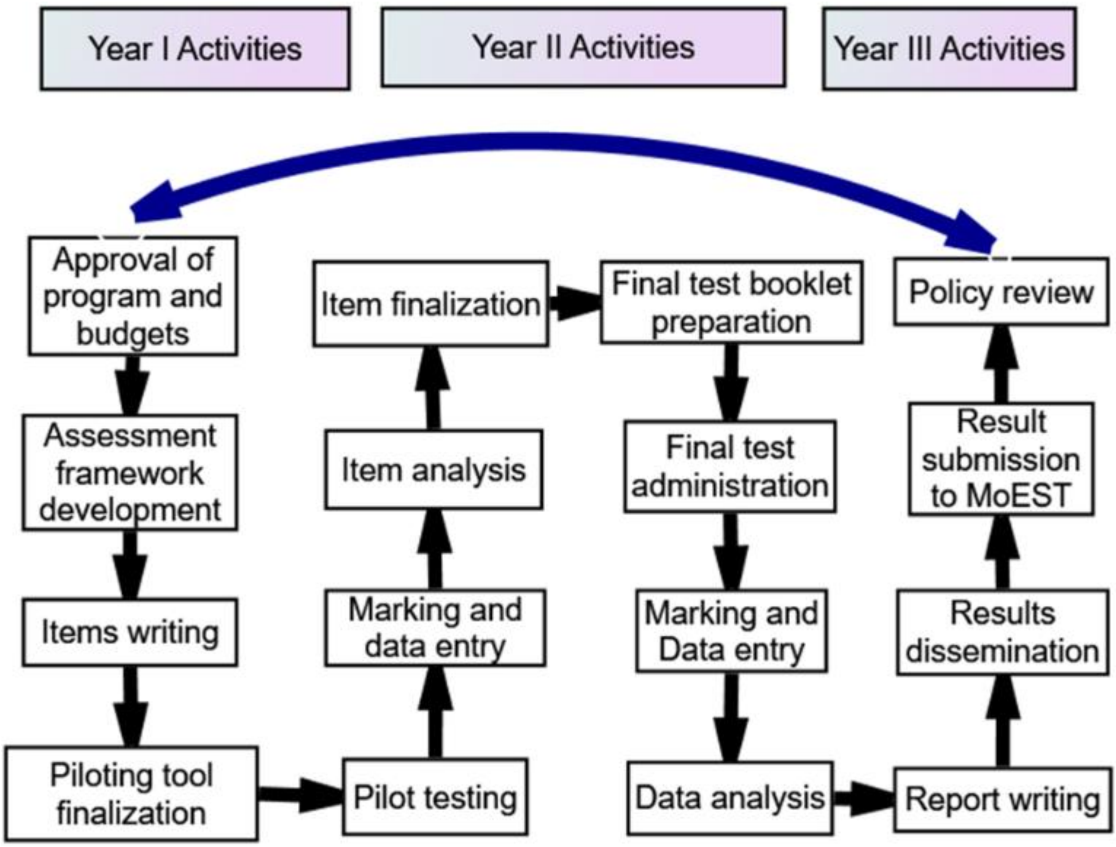

Figure 1. NASA Cycle

Figure 1 outlines the detailed steps involved in the National Assessment of Student Achievement (NASA) process, beginning with the approval of the necessary budget and program. The process starts with the development of the assessment framework, criteria, and standards. This is followed by the creation, piloting, analysis, and selection of test items and questionnaires based on their effectiveness.

Next, test booklets are designed and the tests are administered to selected participants. After the tests are administered, the process continues with scoring, data preparation, data cleaning, item calibration, and test equating to ensure consistency and reliability.

In the final stages, the results are analyzed, proficiency levels are set, and the findings are reported and disseminated to the Ministry of Education, Science, and Technology (MoEST) and other stakeholders. This structured approach ensures a comprehensive and reliable assessment cycle, providing valuable insights into student achievement and informing educational policy and practice.

Objectives of NASA 2022

The purpose of this assessment is to provide valuable feedback to the Ministry of Education, Science, and Technology (MoEST), aiming to enhance the quality of school education. Specifically, NASA 2022 seeks to achieve the following objectives:

- Identify the current level of Grade five students' achievement in Mathematics, Science and Technology, Nepali, and English.
- Identify variations in student achievement based on factors such as gender, province, and type of school, ethnicity, home language, and socio-economic status.
- Explore factors that influence student achievement.
- Identify trends in student learning and produce baseline data for future comparisons.

This structured approach ensures a comprehensive understanding of student performance and the factors affecting it, ultimately guiding improvements in educational quality.

Features of NASA 2022

The Item Response Theory (IRT) was applied to assess students' underlying abilities, incorporating various contextual factors to explain these latent traits. This assessment employs advanced methods to ensure rigorous data analysis, allowing the results to be generalized at both national and provincial levels through the use of seven provinces as explicit strata and schools as implicit strata. Examples of these advanced procedures include the Replicate Model for estimating population parameters and weighted likelihood estimation (WLE) for analyzing and reporting individual student levels. Additionally, improvements have been made in sampling methods, with a probability proportional to size (PPS) sampling method used to select schools as the primary sampling unit (PSU), which are the school clusters. Student achievement at the national and provincial levels is reported on a transformed scale with a mean of 500 and a standard deviation of 50, using the formula:

Average scale score = 500 + (average plausible value ×50).

Features of this report include:

- **Learning-level descriptors** created through rigorous analysis.
- **Presentation of gaps in learning** between the written curriculum and the taught curriculum, shown as achieved curriculum using the defining proficiency level (DPL) method.
- **Enhanced reliability of results** by doubling the sample size answering an item compared to previous years. This was achieved by combining two subjects' test papers for each student. Consequently, each subject's test item set has fewer items, but the number of test booklets has increased.

This approach ensures a comprehensive and reliable assessment of student learning and curriculum effectiveness.

Organization of the Report

Chapter one introduces the National Assessment of Student Achievement (NASA), detailing its historical context and outlining its objectives. Chapter two covers the methodological procedures, including sample selection, item analysis, sample weight calculation, and data analysis. It also discusses contextual variables such as geography, ethnicity, gender, language, and economic status, along with the tools and technologies utilized throughout the study. Chapter three presents the main findings categorized by contextual variables. Chapter four presents the findings in Mathematics, Chapter five presents the findings in Science and Technology, Chapter six presents the findings in Nepali, and Chapter seven presents the findings in English. Chapter eight presents the conclusions and recommendations based on the findings.

CHAPTER TWO

METHODOLOGY

This chapter provides a comprehensive overview of the methodology employed in the study. It begins by detailing the sampling method, explaining how the sample population was defined and the criteria used to ensure a representative sample. This section is crucial as it lays the foundation for the study's validity, ensuring that the findings can be generalized to a larger population. The sampling method is meticulously described, highlighting the steps taken to avoid bias and ensure that the sample accurately reflects the diversity of the population under study.

The chapter then describes the assessment framework, outlining the structure and components that guided the assessment process. This framework serves as a blueprint for the study, providing a clear and organized approach to evaluating the research questions. Each component of the framework is discussed in detail, illustrating how they interconnect to form a cohesive assessment strategy. This section emphasizes the importance of a well-structured framework in conducting a thorough and systematic evaluation.

Following this, the development of various tools used in the study is discussed. This includes a thorough explanation of the design and implementation of these tools, as well as the steps taken to ensure they are effective and appropriate for the research objectives. The chapter delves into the specifics of each tool, describing their purpose, design process, and how they were tested for reliability and validity. This detailed discussion underscores the importance of using well-designed tools to gather accurate and meaningful data.

The chapter also addresses the establishment of contextual variables, defining the variables considered and their relevance to the study. Contextual variables are crucial as they provide a deeper understanding of the factors that may influence the study's outcomes. This section explains how these variables were identified and measured, and why they are essential for interpreting the results. By defining and incorporating these variables, the study ensures a more comprehensive analysis of the data.

To ensure the reliability and validity of the tools, the chapter elaborates on the methods used to test and confirm these attributes. This involves statistical tests and validation techniques that verify the consistency and accuracy of the tools. The chapter provides a detailed account of the procedures used to test the tools, including the statistical methods employed and the criteria for determining reliability and validity. This rigorous testing process is essential for ensuring that the tools produce reliable and accurate data.

In addition to the methodological aspects, the chapter describes the statistical tools and techniques employed in the data analysis. It explains the procedures used to analyze the data, including a detailed comparison of the NASA 2022 data with the previous NASA 2018 data. This section provides a step-by-step account of the data analysis process, highlighting the statistical techniques used to compare and interpret the data. The comparison of the two datasets is particularly important for identifying trends and changes over time.

Moreover, the chapter includes a detailed discussion of the various formulas, symbols, and techniques used in the analysis and reporting of findings. This section provides clarity on the mathematical and statistical methods applied, ensuring that the reader understands how the results were derived and interpreted. Each formula and symbol is explained in context, along with examples of how they were used in the analysis process. This detailed explanation helps to demystify the complex statistical methods used in the study, making the findings more accessible to the readers.

Population

The population of the study encompasses both community and institutional schools that offer grade five. However, certain schools were excluded from the sampling frame: those with fewer than ten students in grade five, as well as schools operated by Gumba, Gurukul, and Madarsha. Initially, the population frame included 17,000 schools, but after applying these exclusions, the sampling frame was reduced to 15,353 schools nationwide.

These schools were then stratified across the seven provinces. Sample schools from each province were selected using the Probability Proportional to Size (PPS) sampling method. As a result, the population for this assessment consisted of all grade five students randomly chosen from the primary sampling units (PSUs).

The exclusion criteria for schools included having fewer than ten students, students who did not respond to the test items during data cleaning, and schools without grade five students. This careful selection process ensured a representative and reliable sample for the assessment. Table 2 shows the province-wise distribution of student population for grade five.

Table 2. Province-wise distribution of student population

Provinces	Boys	Girls	Other	Total
Koshi	48452	46805	1	95258
Madhesh	58459	59574	9	118042
Bagmati	60746	55324	1	116071
Gandaki	25226	22738	1	47965
Lumbini	57990	52860	0	110850
Karnali	23090	23450	2	46542
Sudurpashchim	34897	34668	2	69567
Total	308860	295419	16	604295

Sampling Procedure

Sampling is the process of selecting individuals or sampling units from a predefined sample frame. It is crucial to specify the sampling strategy in advance, as it influences the estimation of the sample size (Krause et al., 2011; Martinez-Mesa et al., 2014). Essentially, sampling involves choosing a representative sample from a larger population (Rahi, 2017).

For this assessment, a multi-stage sampling process was employed. The sampling frame included a list of all 15,353 schools, each identified by unique IDs (school EMIS codes) provided by the Centre for Education and Human Resource Development (CEHRD). This frame also detailed the name, location (province, district, geography, and municipality), ID (code) of each school, categories (community and institutional), and the total number of students, categorized by gender. These data were sourced from the CEHRD's Education Management Information System (EMIS), which is collected annually through a national school census. The target sampling frame for this assessment was based on the 2021 school data, encompassing 604,296 students.

The multi-stage sampling process involved several steps to ensure a representative sample. Initially, schools were stratified by province, district, and type (community and institutional). Within each stratum, schools were selected using a Probability Proportional to Size (PPS) sampling method, ensuring that larger schools had a higher probability of being selected. This approach helped to capture a diverse and representative sample of grade five students across the country.

By employing this rigorous sampling methodology, the assessment aimed to provide accurate and reliable data on student performance, which could be used to inform educational policy and practice. The detailed information collected through the EMIS system ensured that the sampling frame was comprehensive and up-to-date, reflecting the current state of the education system in Nepal.

Sampling Design

The multistage sampling design is crucial for managing the logistical complexities of large-scale national assessments. By stratifying the sampling frame by provinces, the study effectively captures educational disparities and regional characteristics.

In the first stage, the use of Probability Proportional to Size (PPS) ensured that schools with a larger number of students have a higher chance of being selected. This method enhanced the precision and reliability of the findings by ensuring that the sample is representative of the student population.

In the second stage, students from the sampled schools were selected using simple random sampling if the class size exceeded 25 students. If the class size was 25 students or fewer, all students were included in the sample. This approach mitigates any biases that could arise from uneven class sizes and ensures comprehensive data collection.

Overall, this multistage sampling design allowed for a thorough and accurate assessment of educational outcomes, providing valuable insights into regional differences and helping to inform policy decisions.

Stratification by Provinces

To accurately reflect the geographic and administrative diversity of the country, the sample frame was meticulously stratified by the seven provinces. This stratification ensured that regional variations in educational outcomes were effectively captured, providing a balanced representation across different areas.

Stratifying the sample by provinces was essential as it allowed for a more nuanced and precise analysis of educational performance. This approach highlighted province-specific challenges and achievements, enabling policymakers and educators to identify and address unique issues within each province. By doing so, it fostered a comprehensive understanding of educational dynamics nationwide.

This detailed stratification was crucial for developing targeted interventions and policies that cater to the specific needs of each province, ultimately contributing to the overall improvement of the education system.

Probability Proportional to Size (PPS) Sampling

In the first stage, Probability Proportional to Size (PPS) sampling was employed to select schools. This method takes into account the varying sizes of schools, ensuring that those with larger student populations had a higher probability of being selected. This was crucial for achieving a representative sample of the student population.

By using PPS sampling, the sample was more likely to reflect the actual distribution of students across different schools. This ensured that the results were generalizable to the entire student population, enhancing the accuracy and reliability of the findings. Consequently, this approach provided a comprehensive understanding of the educational landscape, capturing the diversity and distribution of students across various schools.

This method not only improved the precision of the assessment but also ensured that the insights gained were applicable on a broader scale, thereby informing more effective educational policies and practices.

Primary Sampling Unit (PSU)

In this study, the primary sampling unit (PSU) was the school. By selecting schools in the first stage, the study ensured that various school-level factors, such as resources, infrastructure, and location, were adequately represented in the sample. This approach captured a diverse array of school environments and conditions, offering a comprehensive overview of the educational landscape.

By including these varied factors, the study could provide a more detailed and accurate understanding of how different school settings impact educational outcomes. This enriched analysis allowed for a deeper insight into the influence of school-level characteristics on student performance, highlighting the importance of context in educational assessments. Consequently, the findings could inform more targeted and effective educational policies and interventions, tailored to address the specific needs and challenges of different school environments.

Simple Random Sampling within Schools

In the second stage of the sampling process, students within the selected schools were chosen. When there were more than 25 students in Grade five, simple random sampling was employed.

This method avoided the potential biases and ensured that each student had an equal chance of being selected, preserving the randomness and impartiality of the sampling process.

However, when there were 25 or fewer students in a class, all students were included in the sample. This approach ensured that the sample size was adequate for statistical analysis, even in smaller classes. By combining these methods, the study maintained the integrity of the sampling process while ensuring comprehensive data collection.

This dual approach ensured that the sample remained both representative and sufficient in size for robust data analysis. It allowed the study to capture a wide range of student experiences and outcomes, providing a thorough and accurate understanding of educational performance across different school settings. This comprehensive data collection was crucial for informing effective educational policies and interventions.

Sample Size Determination

Educational assessment-based research studies indicate that to achieve precise sampling, a simple random sample (SRS) of 384 students is required for the primary criterion variable (Cohen et al., 2007). This sample size ensures a 95% confidence interval for the student-level estimate with a 3% margin of error (Krejcie & Morgan, 1970). However, in a large-scale national assessment, achieving perfect random sampling is challenging. Therefore, the sampling design involves a combination of various techniques at different stages, such as stratification, clustering, and random selection of students.

To address these complexities, the design effect caused by multistage sampling must be calculated and adjusted when determining the sample size. In this assessment, the actual sample size was determined using multistage sampling methods. Data from a recent grade three assessment was used to estimate the intra-class correlation (ICC). With an ICC of 0.5 and a school cluster size (C) of 25, the design effect (Deff) was calculated using the following formula:

$$Deff = 1 + (C - 1) \times r$$

where:

Deff = design effect

C = the size of the cluster (number of students within the school who will be assessed in a subject)

r = intra-class correlation (ICC)

To calculate the clustered sample size (CSS), the following formula was used: CSS = ESS × Deff, where **ESS** is the effective sample size. This approach ensures that the sample size is adjusted for the design effect, providing a more accurate and reliable representation of the student population.

Sampling Frame

The sampling frame for this study included all schools that offer classes up to grade five, totaling 15,353 schools across 75 districts, with two districts excluded from the total 77. To ensure comprehensive representation, the sampling frame was stratified by the seven provinces. This stratification was essential as it captured the regional variations in educational outcomes, ensuring that the sample accurately reflected the diverse educational environments across different areas.

By incorporating this stratified approach, the study aimed to provide a detailed and balanced understanding of educational performance throughout the country. This method allowed for a nuanced analysis of how different regions perform educationally, highlighting both strengths and areas needing improvement. Ultimately, this approach ensured that the findings were representative and could inform targeted educational policies and interventions that might address the specific needs of each province.

First Stage: Selection of Schools

In the first stage, 450 schools were selected for each subject, resulting in a total of 1,800 schools (450 schools x 4 subjects). The selection process utilized the Probability Proportional to Size (PPS) sampling method. This method ensured that schools with larger student populations had a higher probability of being selected, thereby accurately reflecting the diverse school sizes within the sample frame. Schools with no students or fewer than 10 students were excluded from the sample frame. In this context, the school served as the Primary Sampling Unit (PSU).

Second Stage: Selection of Students

From each sampled school, students in grade five were selected. If a grade five class had more than 25 students, a simple random sampling technique was used to select 25 students. This approach ensured that each student had an equal chance of being included in the sample, maintaining the randomness and unbiased nature of the sampling process. However, if a class had 25 or fewer students, all students were included in the sample to ensure sufficient data for analysis. In this study, the unit of analysis was the individual student. To ensure a better representation of the sample at the national level, multistage probability sampling was adopted in the selection of sample units. The sampling design is presented in Figure 2.

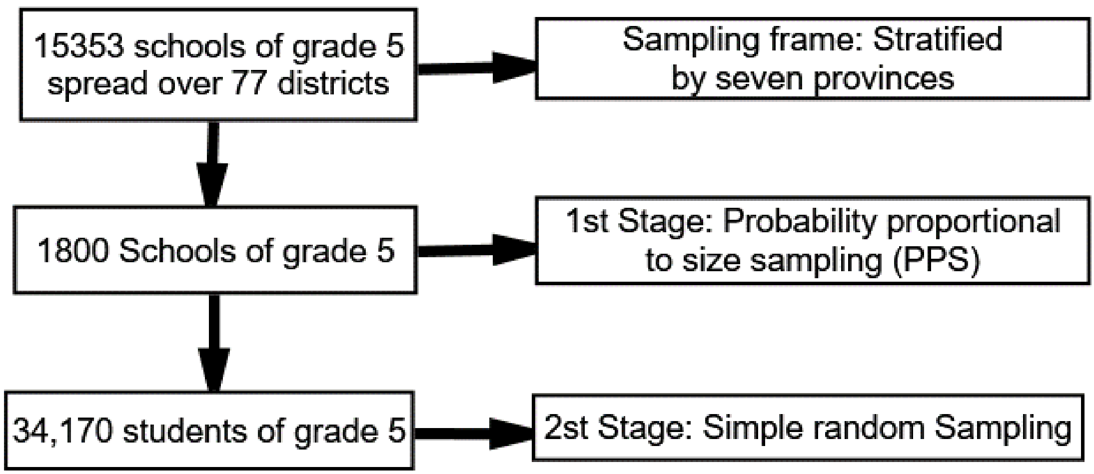

Figure 2. Steps for Sampling Frame

Data Weighting

To generalize the findings of the assessment at the national level, the sample was weighted using two parameters: school weight and student weight. These weights were calculated separately for schools and students. The final combined weight was then determined by multiplying the school weight by the student weight. This weighted approach ensured that the findings of the assessment accurately reflect the national student population. Consequently, the results were based on a weighted sample, providing a more precise and representative analysis of the educational outcomes across the country.

Weighting Parameters

School Weighing

This parameter ensured that different schools were appropriately represented in the sample, giving schools with larger student populations a proportionate influence on the overall findings. For instance, if school A has twice as many students as school B, each student from school A might be given half the weight of a student from school B to balance their representation. Each school's weight was calculated based on factors such as the total number of students enrolled, the type of school (community or institutional), and geographic location.

For the selection of schools, school-level weights were calculated for all sampled schools using the following formula: $\mathrm{BW}_{\mathrm{sc}}^{\mathrm{i}} = \frac{\mathrm{N}_{\mathrm{pop}}}{\mathrm{n}_{\mathrm{scl}} \times \mathrm{N}_{\mathrm{mos}}^{\mathrm{i}}}$, where N_{pop} was the total number of students (population size), n_{scl} was the total number of schools sampled within each explicit stratum, and N_{mos}^{i} The size was assigned to the school.

Weights at the school level were computed for all sampled schools that met the criteria for eligible student participation in the study. To address the possibility of non-response by the schools, a school-level non-response adjustment was calculated separately for each explicit stratum using the following formula: $Sc_{adj} = \frac{n_{scl}}{n_{pscl}}$, where n_{scl} was the total number of sampled schools and n_{pscl} was the actual number of participated schools.

The final step involved adjusting the school weight to account for non-participation, resulting in the final school weight. This final weight was obtained by multiplying the school's weight by the non-participation adjustment: $W_{sc} = BW_{sc}^{i} \times Sc_{adj}$.

This comprehensive weighting process ensured that the sample accurately reflected the diverse school environments and student populations, providing reliable and generalizable findings.

Student Weighting

This parameter ensured the fair representation of individual students within each school, preventing students from larger schools from disproportionately influencing the results. For instance, if a school had a higher number of male students, each female student might be assigned a slightly higher weight to balance their representation. Each student's weight was calculated based on various factors, including gender, grade level, socioeconomic status, and other relevant characteristics. This approach ensured that the sample accurately reflected the diversity of the student population, providing a balanced and comprehensive analysis of the educational outcomes.

For schools containing 25 grade five students, the student weight was set at 1. For schools with over 25 students or fewer, the base weight was determined using the following formula: $BW_{st} = \frac{N_{st}}{n_{st}}$, where $\mathrm{N_{st}}$represented the overall count of grade five students in the selected school, while n_{st}denotes the number of students sampled from the class. An adjustment for student non-participation was computed for schools where at least one eligible student, who was sampled, opted out of the test for some reason. This adjustment was determined using the following formula: $St_{adj} = \frac{n_{st}}{n_{pst}}$, where n_{st}represented the count of sampled students and n_{pst}denoted the number of students who took part in the study in the specific school. The final student weight for a given school (^{i}th school) was subsequently determined by multiplying the student weight by the non-participation adjustment as below:

$$W_{st}^{i} = BW_{st}^{i} \times St_{adj}.$$

The final weight was thus the adjustment between the product of the school and student final weights

$$W_{i} = W_{sc}^{i} \times W_{st}^{i}$$

Once the individual weights for schools and students were calculated, they were combined to create a final weighted value for each respondent. This process involved multiplying the weight assigned to the school by the weight assigned to the student for every participant. This approach accounted for the influence of both school-level and student-level factors on the overall representation of each respondent within the assessment dataset.

The findings of the assessment were then based on this weighted sample. In this context, the term “weighted sample” referred to a dataset where each response was not treated equally. Instead, responses were weighted based on factors such as school and student weights. By assigning varying weights to different responses, the assessment accounted for the diversity within the sample, ensuring that the results were more reflective of the entire population rather than solely representing the specific individuals surveyed. This method enhanced the accuracy and generalizability of the assessment findings, providing a comprehensive understanding of the educational landscape.

By weighting the sample according to school and student parameters, the assessment results could be generalized more accurately at the national level. This approach ensured that the weighted sample better mirrored the demographic and population characteristics of the entire country, rather than just reflecting those of the individuals surveyed. By incorporating both school and student weights, the assessment achieved a more comprehensive representation of the population. This method allowed for more robust and reliable generalizations to be made from the findings, providing a clearer and more accurate picture of the educational landscape across the nation.

Sample Distribution

The sample distribution for the subjects of English, Mathematics, Nepali, and Science and Technology had been meticulously stratified by province to ensure that it accurately represented the geographical diversity of the student population. This stratification was crucial as it allowed for a balanced representation across different provinces, enabling the comparison of educational outcomes and the identification of region-specific patterns or issues.

The number of schools selected from each province for the subjects of English, Mathematics, Nepali, and Science and Technology reflected the proportion of the total student population in each province. This proportional representation ensured that the findings of the study were generalizable to the entire population of grade five students in the country. By aligning the sample distribution with the demographic makeup of each province, the study was able to provide a more accurate and comprehensive analysis of educational performance across the nation.

Table 3 Distribution of the actual sample of English and Mathematics by province

Provinces	Sample Size for English		Sample Size for Mathematics		Population	
	Frequency	%	Frequency	%	Frequency	%
Koshi	1202	13.3	1309	15.7	95258	15.76
Madhesh	1531	17.0	1372	16.5	118042	19.53
Bagmati	1753	19.4	1495	17.9	116072	19.21
Gandaki	1025	11.4	1017	12.2	47965	7.94
Lumbini	1463	16.2	1300	15.6	110850	18.34
Karnali	1015	11.3	692	8.3	46542	7.70
Sudurpashchim	1028	11.4	1145	13.7	69567	11.51
Total	9017	100.0	8330	100	604296	100.00

The actual distribution of the sample for the subjects of English, Mathematics, Nepali, and Science and Technology by province is presented in the tables (Table 3 and Table 4), highlighting the careful consideration given to achieving a representative and balanced sample. This approach not only enhanced the reliability of the study's findings but also ensured that the diverse educational contexts within the country were adequately captured and analyzed.

Table 4 Distribution of the actual sample of Nepali and Science and Technology by province

Provinces	Sample Size for Nepali		Sample Size for Science and Technology		Population	
	Frequency	%	Frequency	%	Frequency	%
Koshi	1281	15.5	1321	14.9	97501	16.13
Madhesh	1396	16.9	1202	13.6	113768	18.83
Bagmati	1568	19.0	1584	17.9	126701	20.97
Gandaki	890	10.8	1017	11.5	45812	7.58
Lumbini	1353	16.4	1833	20.7	136578	22.60
Karnali	859	10.4	1129	12.8	40443	6.69
Sudurpaschim	909	11.0	754	8.5	43493	7.20
Total	8256	100	8840	100.0	604296	100

Tools Development

The development of the assessment tool was meticulously guided by the approved assessment framework. This framework was drafted by a team of subject experts and assessment specialists. It underwent a series of discussions and feedback sessions before being finalized in a meeting with the concerned subject committee. The framework included subject-specific guidelines and objectives, defining the content domain for each subject, criteria and standards for student proficiency levels, cognitive domains, and item development (ERO, 2019).

The assessment framework not only outlined the domains and constructs to be assessed in Mathematics, Science and Technology, Nepali, and English but also provided a comprehensive methodological framework. This included the sampling frame, sampling procedures, tool development procedures, piloting and test analysis, test administration, data collection, and data analysis procedures. The assessments were guided by the frameworks for Nepali and Mathematics from 2019 and for English and Science and Technology from 2021.

Table 5 presents the reliability scores for each subject, indicating the consistency of the assessments. Mathematics had a reliability score of 0.87, demonstrating a high level of consistency. Science and Technology followed closely with a reliability score of 0.86, also reflecting strong reliability. English stood out with the highest reliability score of 0.93, suggesting exceptional consistency in its evaluation. In contrast, Nepali had a relatively lower reliability score (0.78) compared to the other subjects.

Table 5. Reliability of assessment tools for Mathematics, Science and Technology, English and Nepali

	Mathematics	Science and Technology	English	Nepali
Reliability	0.87	0.86	0.93	0.78

The assessment tool was composed of three distinct parts. The first part was a background questionnaire that contained questions common to all subjects, providing a general overview of the students' demographic and educational backgrounds. The second part was a subject-specific background questionnaire, tailored to gather detailed information relevant to each particular subject. The third part consisted of subject-specific test items, which were meticulously constructed based on criteria defined by the curriculum analysis in the Assessment Framework. This process ensured that the test items accurately reflected the content and cognitive demands of the curriculum, providing a robust measure of student proficiency in each subject. Table 6 presents the content domain and criteria for Science and Technology and Table 7 presents the content domain and criteria for Mathematics. Likewise, Table 8 presents the content domain and criteria for English and Table 9 presents the content domain and criteria for Nepali assessments.

Table 6. Content domain and criteria of Science and Technology

Domain	Criteria	Weightage
Living Beings	1. Adequate knowledge and understanding of the classification and characteristics of vertebrates 2. Adequate knowledge and understanding of the classification and characteristics of invertebrates 3. To draw the simple figure of a plant and animal cell, and then explain the structure of the cell. 4. To observe and identify the different stages of the life cycle of insects (e.g., butterfly) and explain the characteristics of each stage. 5. To distinguish the monocot and dicot plants and list their characteristics. 6. Adequate knowledge and understanding of different parts of plants and explain the function of each part. 7. To explain the simple life processes of animals and plants (e.g., Nutrition, respiration, excretion and internal transportation. 8. To illustrate the interrelationship between living beings and the environment, and then explain the importance to each other.	35%
Environment	9. To state different activities of human beings that affect the environment. 10. To tell and apply the ways of environmental conservation.	14%
Matter and Energy	11. To explain sources, types and uses of energy. 12. To explain the change in state of matter after cooling and heating. 13. To identify and explain the processes of change of the state of matter.	18%
The Earth and the Universe	14. To explain the structure of the Earth. 15. To explain the solar system	17%
Communication Technology	16. Adequate knowledge and understanding of the sources of information and the use of familiar means of communication	8%
Basic Indigenous Technologies	17. Sufficient knowledge and importance of basic indigenous technologies in the context of Nepal.	8%

Table 7. Content domain and criteria of Mathematics

Content Domain	Criteria	Weightage	Allocated marks	Level of Standards
Geometry	• Measurement of the angles between $0° \, to \, 180°$ in the difference of 15 degrees • Measurement of the angles and sides of a given triangle and quadrilateral. • Classification of triangles according to the measures of sides and angles. • Calculation of the perimeters of rectangles • Calculation of the area of rectangular objects and solution of the simple verbal problems. • Calculation of the volume of cuboids by using the formula	14%	7	Pre-basic: 15% Basic: 35% Proficient: 35% Advance: 15%
Numeracy	• Demonstration of the capacity to count and read the numbers greater than crore (ten million), read and write the numbers up to a million and identify and write the place value of the digits greater than crore (ten million). • Identification of the prime and composite numbers from 1 to 100. • Expression of the numbers to the nearest thousand. • Calculation of the square of 1 to 10, cube of 1 to 5, square root of square numbers from 1 to 100 and cube roots of cubic numbers from 1 to 125. • Factorization of 3-digit numbers using a prime factor method.	18%	9	
Arithmetic	• Solution of the numerical and daily life problems by using any two	31%	15	

Content Domain	Criteria	Weightage	Allocated marks	Level of Standards
	operations among -, +, $\times, and\ \div$ together with two brackets $\{()\}$. • Conversion of mixed numerals and improper fractions into each other. • Addition and subtraction of mixed numerals (up to two terms) and finding the product of simple fractions. • Solution of the verbal problems related to the addition and subtraction of fractions. • Conversion of fractions and decimals from each other (up to three digits from decimal). • Addition and subtraction of decimal numbers (three numbers after the decimal) and solution of simple problems related to daily life. • Rounding off the decimal numbers to the nearest place. • Conversion of fractions and percentages into each other and solution of the simple daily life-related problems on percentages. • Solution of the problems by using the unitary method. • Calculation of simple interest by using a unitary method.			
Time, Money and Measurement	• Multiplication and division of the units of time and solution of related verbal problems. • Solution of the verbal problems related to rupees and paisa. • Multiplication and division related to distance and the solution of related verbal problems	14%	7	

Content Domain	Criteria	Weightage	Allocated marks	Level of Standards
	• Estimation of length, breadth, height of given objects, and estimation of distances of places from the surroundings of the house or school. • Multiplication and division related to litres and millilitres and solution of related verbal problems. • Multiplication and division of gram and kilogram and solution of weight-related simple problems. • Estimation of the weight of any object and identification of the relation between kilogram and quintal.			
Bill, Budget and Statistics	• Preparation of simple bills. • Identification of the information from a family budget description. • Derivation of information and conclusion from tabulated information. • Presentation of simple information in a bar graph. • Demonstration of ordered pairs in a graph (first quadrant only).	9%	5	
Sets and Algebra	• Presentation of a given set using a set { }. • Expression of simple verbal problems into algebraic expressions and their solutions (up to 2-term addition and subtraction). • Solution of linear equations with one variable, including simple verbal problems by using a linear equation.	14%	7	
Total		100%	50	

Table 8. Content domain and criteria of English

Content domain	No of Criteria	Weightage (%)	Items in each set	Weightage for each level
Reading	6	50%	4 texts, one from each level and a number of items (14)	Level 1: 22% Level 2: 28% Level 3: 28% Level 4: 22%
Writing	5	50%	4 items, one from each level	
Total		100%	18 items in each set	

Table 9. Content domain and criteria of Nepali

Content Domain	Criteria nos.	Weightage (%)	Total Marks	Item in each set	Weightage for each level
Reading	6	60%	36	4 texts (number of items may vary)	Level 1: 15% Level 2: 40% Level 3: 30% Level 4: 15%
Writing	8	40%	24	4 items (number of items may vary)	
Total	14	100%	60	The number of items may vary	100%

Piloting of the NASA

Before the full-scale sample assessment was conducted, a pilot test was carried out to evaluate the accuracy, reliability, and consistency of the assessment items. This pilot test served as a crucial preparatory phase to identify and address any potential issues or challenges that might arise during the actual assessment administration. The following steps were meticulously followed in selecting the items for the final NASA assessment:

1. **Development of Items Based on Assessment Framework**: The initial step involved developing assessment items grounded in the established assessment framework.
2. **Drafting and Approval of Tools**: Subject experts drafted six sets of tools for each subject. These drafts were then reviewed and approved by the respective subject committees.
3. **Pilot Testing**: Upon approval, the six sets of tools were used in a pilot test involving approximately 300 students, with one set administered per subject.
4. **Analysis of Responses**: The responses from the pilot test were analyzed to determine the discrimination and difficulty levels of each item. Based on these analyses, items were selected to create three sets of questions from the original six sets for each subject.

5. **Preparation of Assessment Booklets**: Finally, assessment booklets were prepared, incorporating the selected items and relevant background information.

This structured approach ensured that the final NASA assessment was both robust and effective.

Test Administration and Supervision

The administration of the NASA 2022 assessment was meticulously planned and executed to ensure accuracy and adherence to standardized guidelines. The process involved several key steps and personnel to maintain the integrity and reliability of the assessment:

Selection and Training of Test Administrators*:* Test administrators were selected based on their educational qualifications, requiring at least a bachelor's degree. Importantly, these administrators were not involved in the teaching profession to avoid any potential conflicts of interest. Comprehensive training sessions were conducted for the test administrators to ensure they fully understood and adhered to the standardized National Assessment guidelines during the test administration.

Oversight and Inspection*:* Personnel from the Ministry of Education, Science and Technology, and Technology (MoEST), the Education Review Office (ERO), and the Education Development Coordination Unit (EDCU) were involved in the oversight and inspection of the test administration process. Their involvement ensured that the process was conducted smoothly and in compliance with established standards.

Participation and Focus: Each participating school was assigned to administer the test in only one subject. This approach was designed to maintain focus and clarity during the assessment process.

Role of Teachers: Teachers were not allowed to enter the exam hall to prevent any undue influence on the students. However, they played a supportive role by assisting in filling out the Background Information section of the Questionnaire.

Student Instructions: Clear and concise instructions were provided to the students to encourage them to give their best effort, even though the testing environment was low-stakes.

Post-Test Administration: After the test administration, headteachers were responsible for completing a background information questionnaire to provide additional context for the assessment.

Confidentiality Measures: To protect the confidentiality of the test items, strict measures were implemented. These included prohibiting the copying or photographing of test papers and ensuring that test papers were not retained in the schools after the test.

Collection and Submission of Test Materials: Upon completion of the test administration, the test administrators collected the test booklets and sent them to the EDCU. The EDCU then forwarded these booklets to the ERO for further processing. Additionally, each school submitted monitoring reports, test administrator reports, and lists of participating and non-participating students and schools. These documents were essential for further evaluation and analysis of the assessment process.

This detailed approach ensured that the NASA 2022 assessment was conducted with the highest standards of integrity and reliability.

Data Management

Data management involved three stages:

Database Merge: To gather comprehensive data, three distinct sets of questions were administered, each designed to capture different aspects of the assessment objectives. After the administration of these sets, the responses were consolidated into a single database using Excel. This merging process facilitated centralized data management, ensuring that all responses could be analyzed collectively and efficiently.

Data Cleaning: Once the data were merged, a thorough data cleaning process was undertaken using Excel. This crucial step involved identifying and rectifying any errors, inconsistencies, or anomalies within the dataset. Common tasks during data cleaning included handling missing or erroneous data entries, resolving formatting issues, and standardizing variable names and formats. Ensuring the accuracy and integrity of the dataset through meticulous data cleaning was essential before proceeding with any analysis.

Variable Coding and Recoding: After cleaning the data, the next step involved coding and recoding the variables based on the categories of the assessment items. This process was essential to facilitate a more streamlined and effective analysis. By categorizing and standardizing the variables, the data could be more easily interpreted and utilized for further evaluation.

This detailed approach to data management ensured that the dataset is accurate, reliable, and ready for comprehensive analysis.

Data Analysis Techniques

Utilization of the Hybrid IRT Model

To assess the latent abilities of students, Item Response Theory (IRT) was employed, which takes into account both discrimination and difficulty parameters of test items. Specifically, a hybrid IRT model was utilized that integrates the 2-parameter logistic model (2PL) with the partial credit model (PCM). This innovative hybrid model effectively nested the PCM within the 2PL framework, allowing for a comprehensive evaluation of student abilities across various parameters.

To ensure the robustness of the findings, the latent abilities were generated using a bootstrap sampling method with 450 iterations. The resulting latent ability scores followed a normal distribution, with a mean approximately centred on zero and a standard deviation of one. These scores ranged from -4 to +4, providing a detailed spectrum of student abilities.

To extend the findings to a national level, 10 plausible values of latent ability were derived for each student. This approach accommodated the inherent variability in student performance. After generating these plausible values, their means (averages) were calculated to obtain a single representative value for each student. This mean plausible value was then transformed into an achievement score, standardized with a mean of approximately 500 and a standard deviation of 50, to facilitate comparative analysis.

The achievement scores were generated using the following equation: *Achievement score = 500 + (average plausible value×50).* Table 10 shows the theta value, true score and 10 plausible values generated while running IRT model from Mathematics data of grade five.

Table 10. Sample of latent ability theta value and 10 plausible values in Mathematics

theta	true_score	plausible_value1	plausible_value2	plausible_value3	plausible_value4	plausible_value5	plausible_value6	plausible_value7	plausible_value8	plausible_value9	plausible_value10
-0.05	9	-0.52	-0.59	-0.49	-0.59	0.69	0.63	0.85	0.49	0.68	-0.8
-1.34	2	-2.39	-2.49	-2.53	-1.65	-0.37	-0.26	-0.69	-0.78	-2.91	-0.85
0.24	9	-0.6	0.31	-1.53	0.54	0.57	-2.4	0.03	-0.04	0.59	-0.78
0.24	9	-0.89	1.97	-1.5	-0.72	0.05	0.44	1.88	1.43	0.25	0.42
0.63	10	-0.19	1.11	-0.89	0.01	2.45	-1.33	0.48	-0.12	0.37	-0.35
0.73	9	0.61	0.26	1.76	-0.69	0.04	1.3	1.98	1.48	1.51	-0.09
0.91	21	-1.03	-0.11	0.93	0.93	0.46	0.57	1.74	1.15	0.16	0.47
2.04	30	2.36	1.87	3.18	2.78	2.13	2.11	3.18	2.37	1.63	3.45
1.93	30	3.33	3.18	0.7	3.68	0.99	3.38	3.18	1.03	1.26	2.47
1.74	28	1.93	0.9	2.06	1.86	0.34	2.29	1.05	1	0.91	0.46
1.12	20	1.39	0.34	1.65	0.9	0.43	0.94	1.24	1.8	0.76	1.38
1.69	29	1.18	0.36	1.15	1.92	2.28	0.92	1.2	2.13	2.13	1.84
1.41	25	1.38	0.86	-0.34	1.83	0.34	2.55	0.96	1.82	0.66	0.88
1.4	23	0.87	1.48	1.84	1.95	0.22	2.61	1.04	2.39	2.36	2.13
0.57	11	0.15	-0.51	1.5	1.83	1.61	1.25	0.83	1.25	0.91	-0.03
1.98	32	2.9	1.61	2.92	2.41	3.39	-0.52	3.26	2.71	0.79	0.4
1.09	23	-0.25	1.09	-1.05	-0.39	1.15	-0.64	0.54	0.43	-0.3	-0.18
1.35	25	1.21	1.59	1.63	0.47	1.26	0.44	1	1.84	-0.24	-0.24
1.07	22	0.55	1.75	2.18	-0.78	1.06	2.58	0.3	0.26	1.09	2.68
1.19	24	1.59	2.97	3.17	1.64	-0.39	2.28	1.2	1.92	1.95	-0.89
1.84	31	0.65	2.66	2.8	0.87	1.96	1.39	2.71	2.55	1.81	1.8
-1.25	1	-2.24	-0.17	0.04	-1.57	-2.49	-1.47	-0.34	-3.16	-1.47	-0.2
1.54	19	2.63	2.43	1.41	2.64	2.13	2.97	2.96	2.69	1.41	2.91

Calibration of the Anchor Items

To ensure the comparability of results with previous surveys, it was crucial to calibrate anchor items. In the context of grade five, the results for Nepali and Mathematics were specifically calibrated. This calibration process involved calculating two key parameters, α (discrimination) and β (difficulty), from the data sheet of NASA 2018. These parameters were then fixed to the anchor items of NASA 2022 to maintain consistency.

For the calculation of latent ability (θ), an Item Response Theory (IRT) hybrid model was employed. The IRT model measured the latent ability of students for each item through the Item Characteristic Curve (ICC). For instance, Figure 3 illustrates the ICC graph for item M2q7, which depicts the relationship between student ability and the probability of answering the item correctly. The graph clearly shows that as students' ability increases, the probability of providing a correct answer also increases.

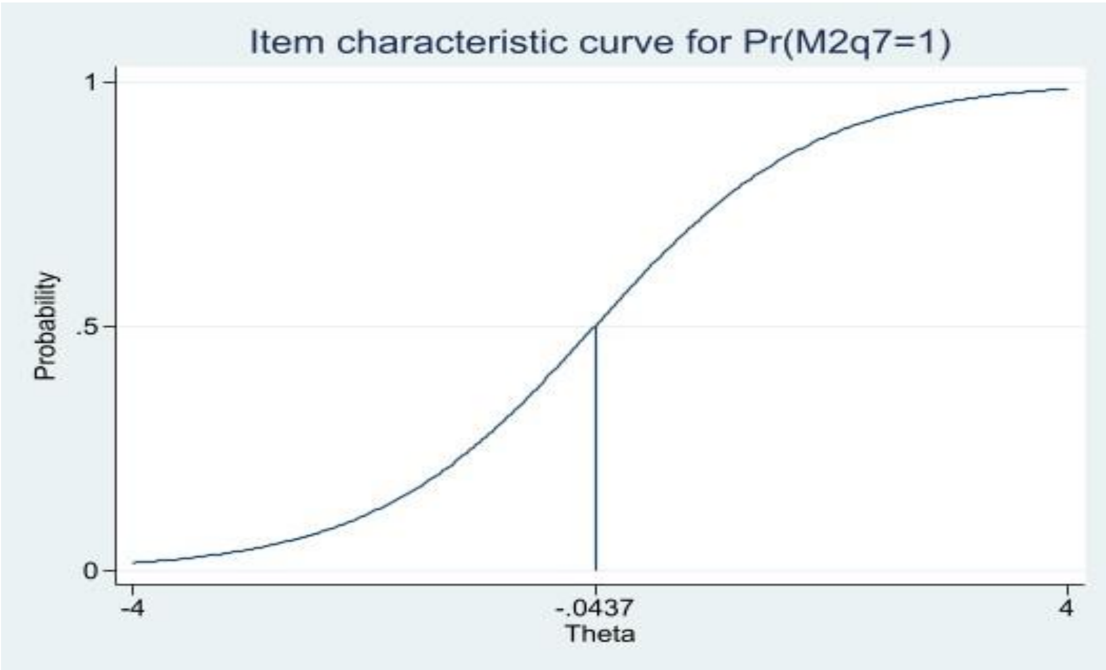

Figure 3 Sample of curve (1) generated after IRT

Similarly, Figure 4 illustrates the abilities of students for items M1q1 and M1q5. The theta values indicate that item M1q5 is relatively more difficult compared to M1q1. Each curve in the figure exhibits similar steepness, which suggests that both items have comparable discrimination power. This means that both items are equally effective in distinguishing between students with different levels of ability.

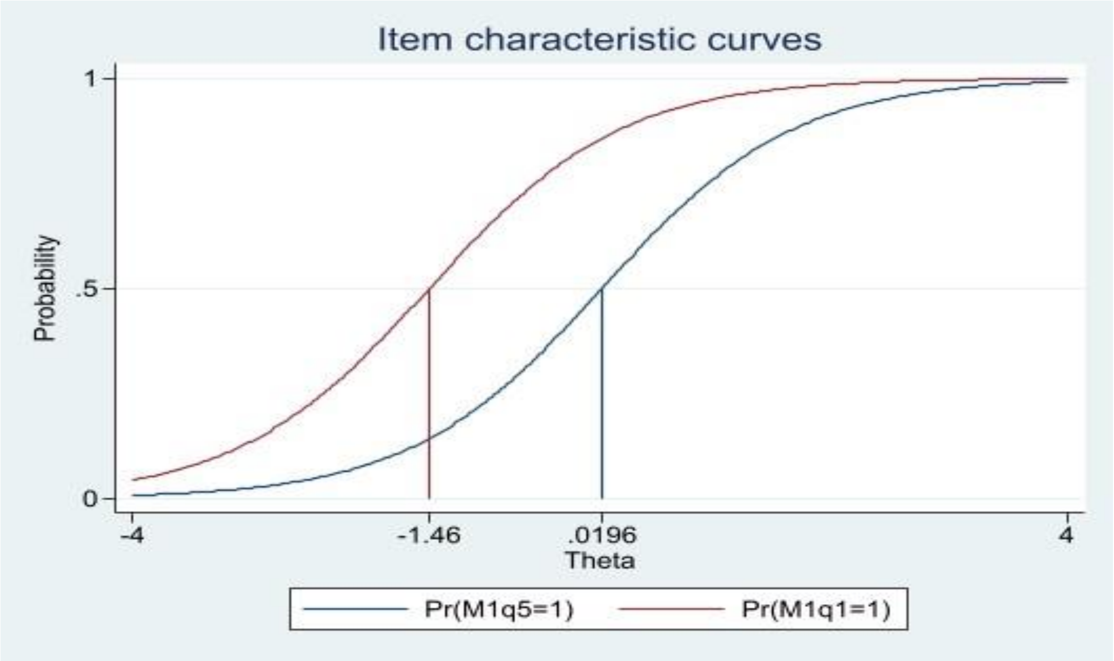

Figure 4 Sample of curve (2) generated after IRT

Proficiency Levels

After obtaining the achievement scores, the next step was to derive proficiency levels based on these scores. According to the assessment framework, four categories of proficiency levels were generated from the achievement scores. Below is a detailed explanation of each level:

Pre-Basic Level: Students whose achievement scores fell within this category demonstrated foundational knowledge and skills. However, they might require additional support and guidance to reach basic competency levels.

Basic Level: Students at the basic level possessed fundamental skills and knowledge within the assessed domain. They showed a satisfactory understanding of the subject matter but still have room for improvement.

Proficient Level: This category included students who exhibited a high degree of competency and mastery in the assessed domain. They demonstrated advanced skills and understanding, indicating a strong grasp of the subject matter.

Advanced Level: Students classified at the advanced level demonstrated exceptional proficiency and mastery in the assessed domain. They exhibited a deep understanding of complex concepts and were able to apply their knowledge in sophisticated ways.

Table 11 shows the ranges of each proficiency level for each subject based on achievement scores used for further analysis. The achievement scores, based on theta values, are divided into four equal intervals. Scores in the first interval fall under the pre-basic level, the second interval under the basic level, the third interval under the proficient level, and the last interval under the advanced level.

Table 11. Ranges of each proficiency level based on achievement score

Proficiency Level	Mathematics	Science and Technology	Nepali	English
Level 1: Pre-basic	Below 458	Below 398	Below 446	Below 428
Level 2: Basic	458-509	398-492	446-497	428-508
Level 3: Proficient	509-561	492-586	497-548	508-588
Level 4: Advanced	561 above	586 above	548 above	588 and above

In 2022, NASA utilized the proficiency level standards established in 2018 to ensure that the results for Nepali and Mathematics were comparable with those from 2018. Additionally, NASA 2022 introduced assessment tests for English and Science and Technology for the first time.

Major Statistical Techniques

The analysis of achievement scores and proficiency levels was conducted using both descriptive and inferential statistics. To illustrate the status of socio-demographic variables and students' proficiency levels, frequency and percentage were employed. The mean, standard deviation, and standard error of the mean were utilized to depict the average achievement scores among different socio-demographic groups.

To determine significant differences in mean scores across socio-demographic variables, independent sample t-tests and one-way ANOVA were applied. Post-hoc statistics were then used to identify mean differences between categories with more than two groups within the independent variables.

Additionally, the mean differences in students' self-reported perceptions towards teachers, schools, subjects, learning, and bullying activities were calculated based on their composite scores. Step-wise multiple linear regression was employed to assess the impact of personal factors, parental factors, and self-reported perceptions of school, teachers' behaviour, and subjects on achievement scores. The assumption of regression analysis like linearity, independence homoscedasticity and normality were checked before applying regression analysis.

Students' self-reported perceptions towards teachers, schools, subjects, and learning were measured on a four-point rating scale ranging from "strongly disagree" to "strongly agree." Self-reported practices were also measured on the same scale, from "never" to "all lessons." Bullying activities were measured in a binary format with yes or no.

The composite scores for perceptions towards teachers, schools, subjects, learning, and practices were calculated using the weighted mean score of each item. These scores were then converted into binary variables based on the population mean of 2.5 (due to the four-point rating scale), with scores below 2.5 classified as negative and scores of 2.5 or above classified as positive. The composite score for bullying variables was calculated by summing the respective variables, categorizing them into "no bullying" (indicating the student did not face any type of bullying) and "bullying" (indicating the student faced at least one type of bullying in the classroom).

CHAPTER THREE

Demographic Information

This section provides a comprehensive overview of the demographic characteristics of fifth-grade students who participated in the assessment. It also presents the detailed distribution of students across the Provinces, Local Governance units (Palikas), and types of schools. Furthermore, it examines the distribution of students based on gender, caste/ethnicity, age, and language. To gain insights into the socio-economic background of the students, the section also includes information on the educational and occupational status of their parents (both mother and father).

Distribution of Sampled Students by Province

Figure 5 presents a detailed percentage distribution of fifth-grade students across seven provinces, categorized by their performance in four subjects: English (n=9017), Nepali (n=8256), Science and Technology (n=8840), and Mathematics (n=8330). The data revealed that approximately one-fifth of the students are from Bagmati Province, with percentages ranging from 19.47% to 22.46%, and from Madhesh Province, with percentages ranging from 18.8% to 23.21%. In contrast, the distribution of students is significantly lower in Karnali Province, ranging from 4.9% to 6.7%, and in Gandaki Province, ranging from 7.00% to 7.6%, across all subjects. This figure highlights the regional disparities in student distribution across the different subjects.

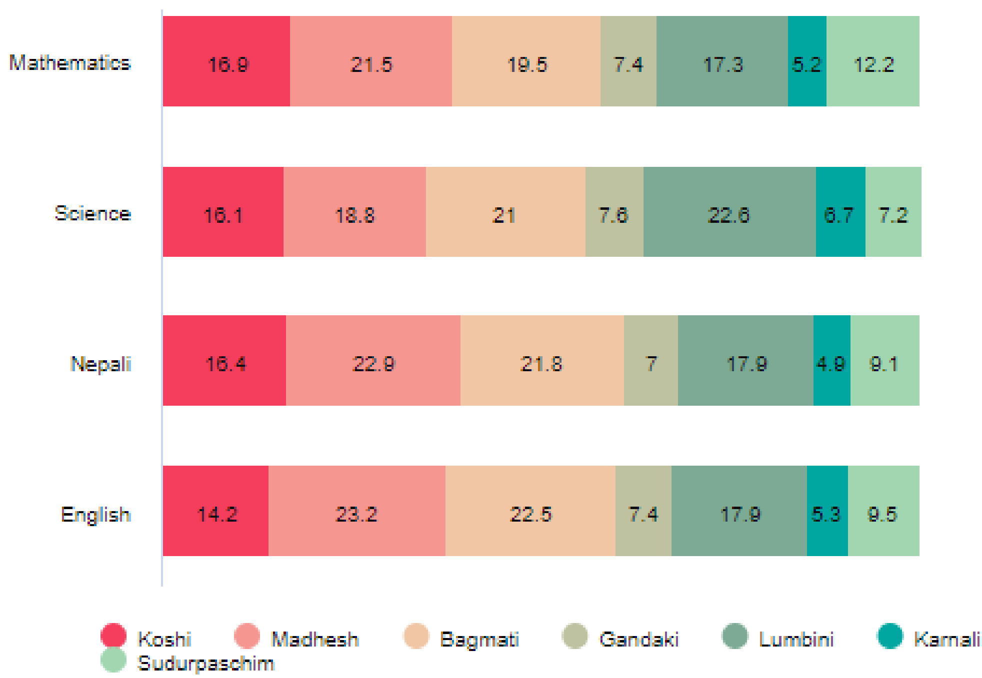

Figure 5 Distribution of students by province in percentage

Distribution of Sampled Students by Types of Local Governance Unit

Figure 6 illustrates the distribution of students by local administrative levels, specifically distinguishing between Rural and Urban Municipalities. The category of Municipalities further includes Metropolitan, Sub-metropolitan, and Municipality classifications. The data revealed that students from rural municipalities made up approximately one-third (33.1% to 35.6%) of the total participants in the subjects of Nepali, English, and Science and Technology. However, their representation in Mathematics was significantly lower, at around one-fifth (20.6%). In contrast, students from urban municipalities constituted a substantial majority, accounting for more than two-thirds (66.1% to 79.4%) of the participants across all subjects.

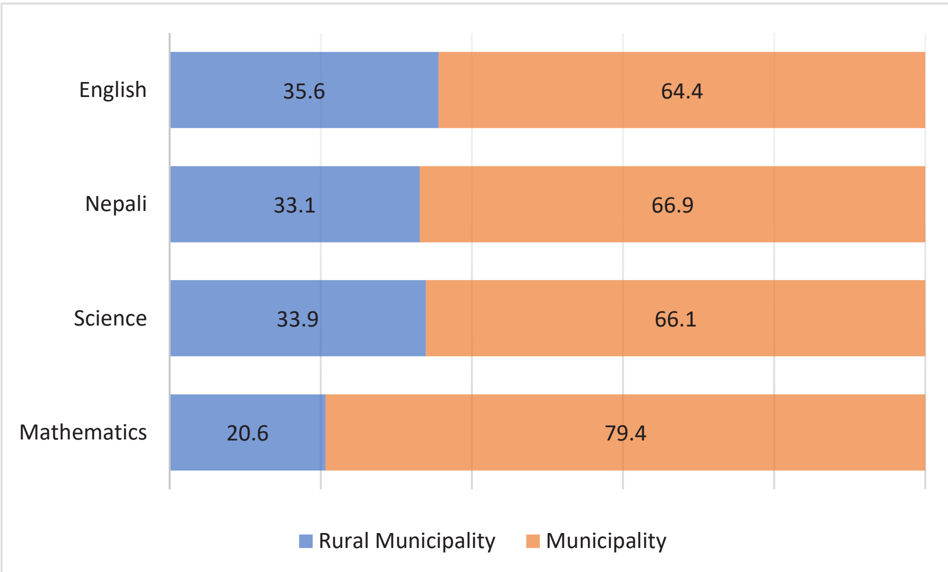

Figure 6 Distribution of the student by types of local level

This figure underscored the disparity in student distribution between rural and urban areas, particularly highlighting the lower participation of rural students in Mathematics.

Distribution of Sampled Students by School Type

This section provides an analysis of the distribution of students based on the type of school they attend, categorized into community and institutional schools as per the regulations of the Government of Nepal. Figure 7 illustrates that students from institutional schools represented approximately one-third of the total participants in English (35.6%) and Nepali (36.7%). Their representation increased to around two-fifths in Science and Technology (36.9%) and Mathematics (39.5%). Conversely, the data indicated that students from community schools constitute a larger proportion in all subjects, with their participation ranging from 60.5% to 64.4%. This highlighted that community school students outnumbering their community school counterparts across all subjects.

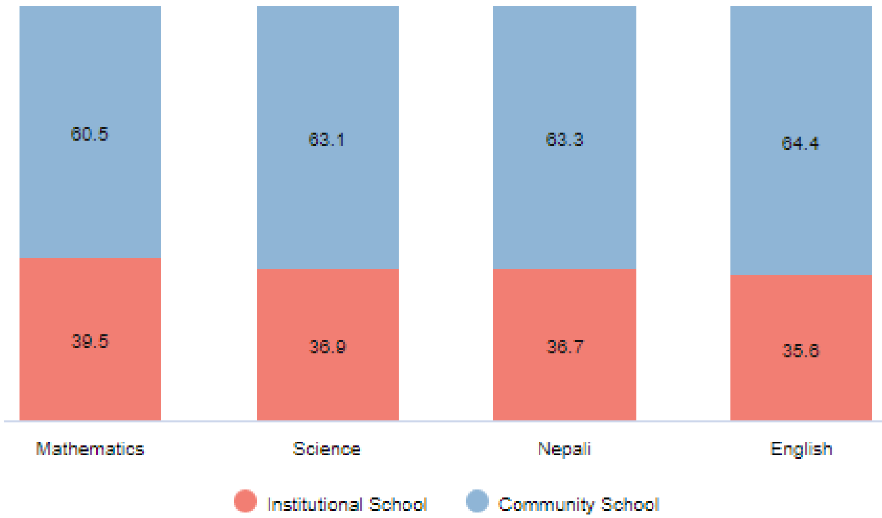

Figure 7 Distribution of students by school type

Distribution of Sampled Students by Gender

This section presents the results based on gender, categorizing students as boys and girls. Figure 8 illustrates the gender distribution of students across various subjects. The data revealed that the number of boys and girls was nearly equal in all subjects. However, there was a slight predominance of girls in English, with a 0.4% higher representation, and in Nepali, with a 0.8% higher representation compared to boys. Conversely, the participation of girls was marginally lower in Mathematics and Science and Technology compared to their male counterparts. This subtle variation highlighted the gender balance in student participation across different subjects, with minor differences in specific areas.

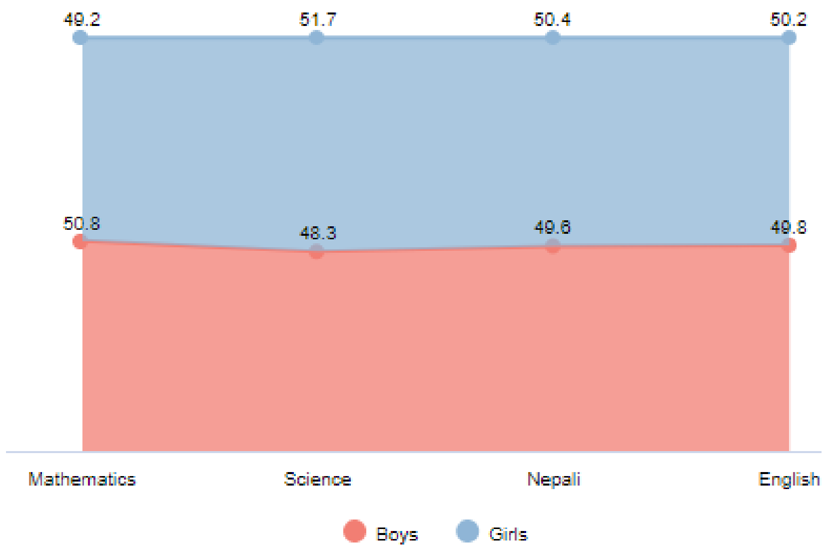

Figure 8 Distribution of students by gender

Distribution of Sampled Student's by Home Language

This section details the distribution of students based on the language spoken at home, categorized into Nepali and other languages. According to Figure 9, the majority of students participating in this research spoke Nepali language at home, with percentages ranging from 53.9% to 64.4%. Specifically, 59.6% of students spoke Nepali at home in relation to Mathematics and Science and Technology, and 62% in relation to Nepali as a subject. However, when it came to the English test, the frequency of students speaking Nepali and other languages at home was nearly equal. This data highlighted the linguistic diversity among students and underscored the predominance of Nepali as the home language for a significant portion of the student population.

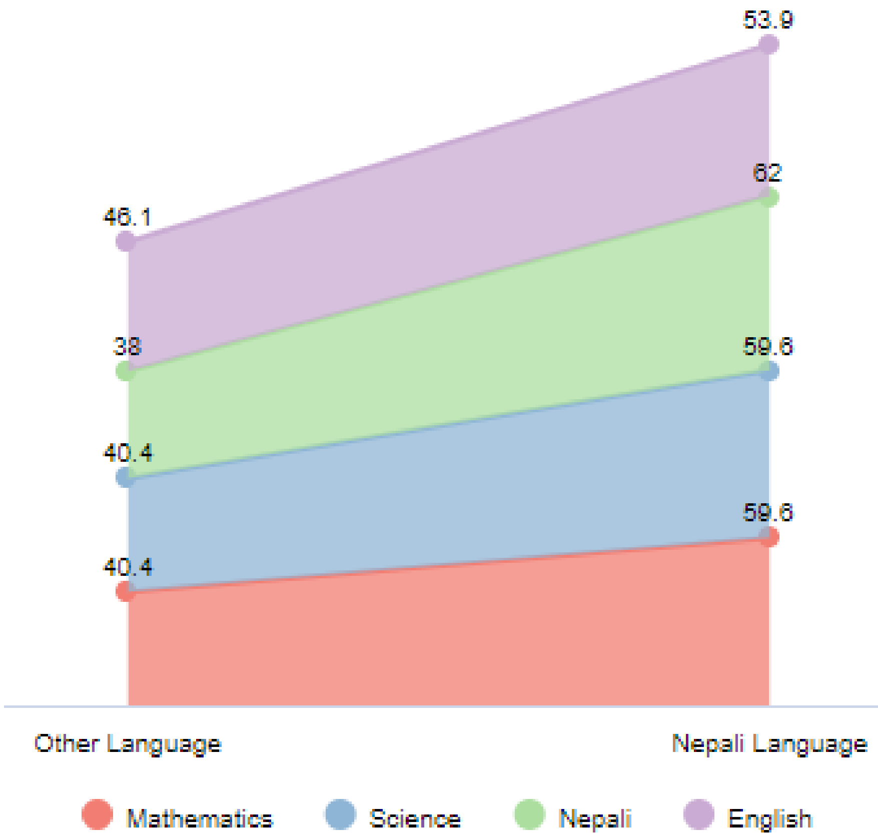

Figure 9 Distribution of the student by spoken language

Distribution of Sampled Students by Medium of Instruction in Science and Technology and Mathematics

This section presents the distribution of students based on the medium of instruction for Science and Technology and Mathematics at their schools. The mediums of instruction were categorized into four groups: Nepali, English, both Nepali and English, and other languages. The 'other' category included languages besides Nepali and English.

Figure 10 illustrates the distribution of students who took the Science and Technology achievement test, while Figure 11 shows the same distribution for Mathematics.

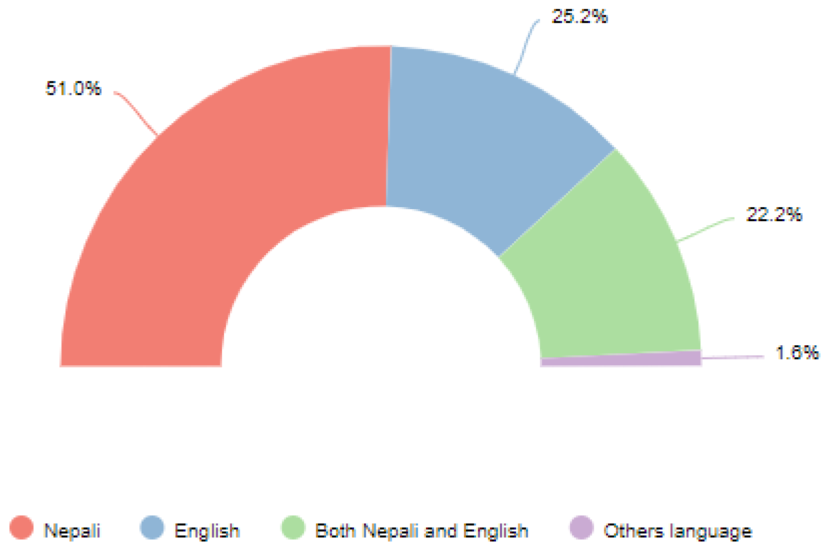

Figure 10 Distribution of students by medium of instruction in Science and Technology

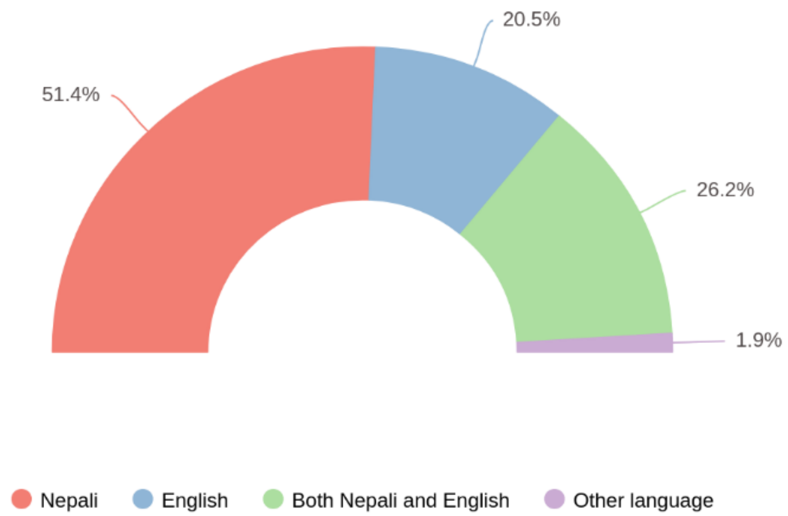

Figure 11 Distribution of students by medium of instruction in Mathematics

The data revealed that a significant majority of students were taught in Nepali, with 51% in Science and Technology and 51.4% in Mathematics. Conversely, the proportion of students instructed in languages other than Nepali and English was minimal, ranging from 1.6% to 1.9% in both subjects. This pattern highlighted the predominant use of Nepali as the medium of instruction in these subjects.

Distribution of Sampled Students by Educational Status of Their Parents

The distribution of students based on their parents' educational status, categorized into six levels: illiterate, literate, grade 10, grade 12, bachelor, and master and above. Here, 'illiterate' refers to individuals who cannot read or write, while 'literate' denotes those who can read and write but have not completed formal schooling. 'Grade 10' and 'grade 12' indicate completion of education up to those respective grades.

Figure 12 illustrates the distribution of students according to their parents' education levels, encompassing both fathers and mothers. The data revealed that approximately one-fourth of the mothers of students who participated in the achievement tests were illiterate: 25.4% in English, 23.5% in Nepali, 23.1% in Science and Technology, and 24.4% in Mathematics. In contrast, the proportion of students whose parents held a bachelor's degree or higher was below 15% across all subjects.

The figure also highlights a notable disparity: the number of illiterate mothers was higher compared to illiterate fathers, while fathers were more likely to hold a bachelor's degree or higher than mothers. This pattern underscored the educational gap between genders among the parents of the students surveyed.

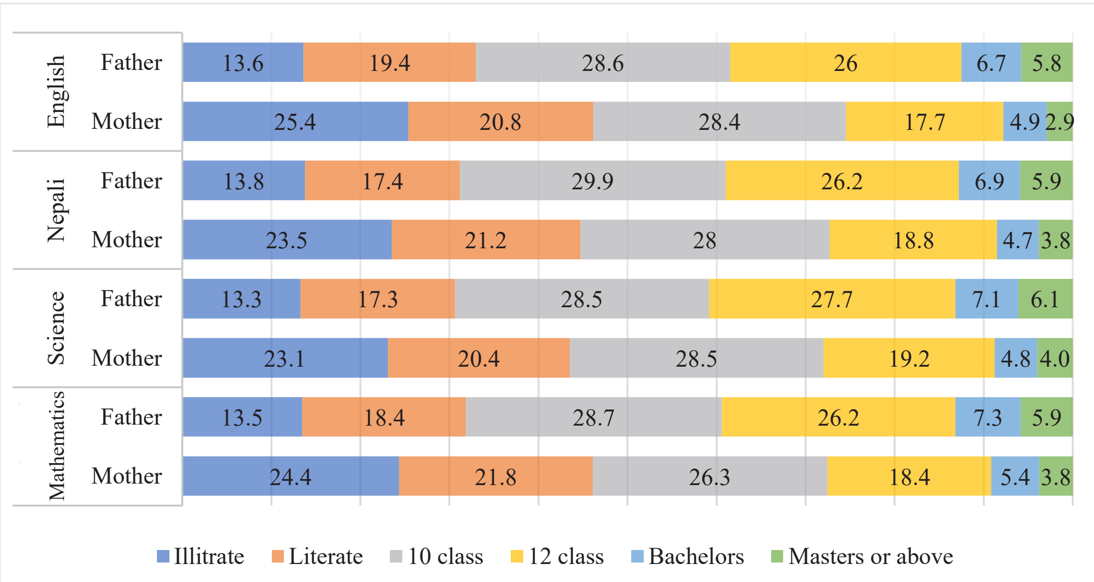

Figure 12 Distribution of the student by the education level of their parents

Distribution of the students by the occupation of their parents

This section presents the distribution of students based on their parents' occupations, which were classified into nine categories: farming and housework, housework only, work in other households, labour work, foreign work (employment abroad), teaching, business, government jobs, and other occupations.

Table 12 illustrates the distribution of students according to their parents' occupations, encompassing both fathers and mothers. The data revealed that approximately half of the mothers were engaged in farming and housework, with participation rates in the English (52.2%), Nepali (50.6%), Science and Technology (50.7%), and Mathematics (52.4%) achievement tests. In contrast, less than one-third of fathers held the same occupations, with participation rates ranging from 26.2% to 29.9%.

The results further indicated that over three-quarters of mothers were involved in either farming and housework or housework only, with participation rates between 76.8% and 80.7%. Additionally, about one-fourth of fathers were employed abroad, with participation rates ranging from 23.9% to 26.3%. The frequency of other job categories was found to be low across all subjects. This data highlighted the significant role of farming and housework in the livelihoods of students' mothers, while a notable proportion of fathers were employed abroad.

Table 12 Distribution of the student by the occupation of their parents in percentage

Categories	English		Nepali		Science and Technology		Mathematics	
	Mother	Father	Mother	Father	Mother	Father	Mother	Father
Farming and Housework	52.2	29.9	50.6	28.7	50.7	26.2	52.4	27.4
Housework only	28.5	4.3	29.4	3.8	29.6	4.0	28	3.8
Work in Other's House	1.4	2.1	1.3	1.6	1.4	2.0	1.3	1.9
Labour Work	2.6	7.5	1.9	7.4	2.2	7.8	2.1	6.4
Foreign Work	2.4	26.3	2	24.5	2.6	23.9	2.2	24.2
Teaching	3.6	4.4	3.4	3.8	3.7	3.8	4	4.1
Business	6.5	16.3	6.2	14.6	6.9	15.9	6.7	16.1
Government job	2.8	9.3	2.7	7.8	2.9	7.5	3.3	8.7
Other Occupation	0	0	2.6	7.9	0	8.9	0	7.4

CHAPTER FOUR

Students' Performance in Mathematics

National Mean Achievement Scores in Mathematics

The national mean achievement score for students in Mathematics was assessed using anchor items from the NASA 2018 study. These anchor items served as a benchmark to ensure consistency and comparability between different assessment years. For the NASA 2022 study, the same anchor items were recalibrated by fixing their parameters, which means their characteristics were kept constant to maintain a stable reference point.

The discrimination and difficulty levels of these anchor items were calculated using the data from NASA 2018. Discrimination refers to how well an item can differentiate between students of varying abilities, while difficulty indicates the level of challenge an item presents. By analyzing these parameters, researchers ensured that the anchor items were reliable indicators of student performance.

Additionally, the differential item functioning (DIF) method was employed to identify both uniform and non-uniform items. DIF analysis helped detect items that might function differently for distinct groups of students, such as those from different demographic backgrounds. Uniform DIF indicated consistent differences across all levels of ability, while non-uniform DIF showed varying differences at different ability levels. Identifying and addressing these items ensured fairness and accuracy in the assessment.

Once the appropriate items were confirmed through DIF analysis, calibration was performed. Calibration involved adjusting the scoring of items to align with the established parameters, ensuring that the assessment results were valid and comparable over time.

The results from NASA 2022 revealed that the mean transformed scale score in Mathematics is 484.6. This score was lower than the mean achievement score of 500 from NASA 2018, indicating a decline in overall student performance in Mathematics over the four-year period (Figure 13). This comparison highlighted areas where educational interventions might be needed to improve student outcomes.

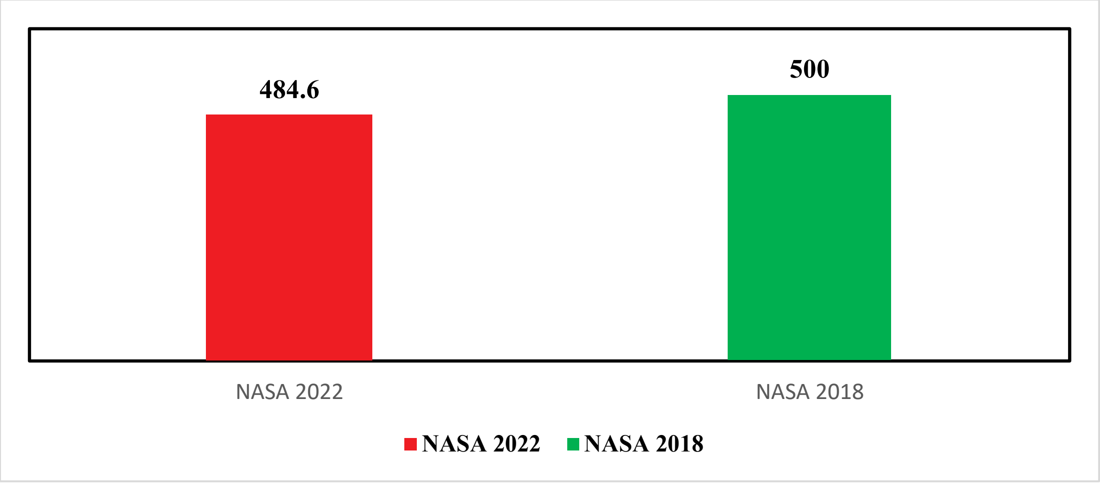

Figure 13 Mean achievement score in Mathematics in NASA 2018 and 2022

The decrease in the mean transformed scale score in Mathematics from 500 in NASA 2018 to 484.6 in NASA 2022 indicated a significant learning loss among grade five students in this subject. This decline suggested that students did not grasp mathematical concepts as effectively as they did four years ago, potentially due to various factors such as changes in curriculum, teaching methods, or external influences like the COVID-19 pandemic.

Figure 14 illustrates the distribution of achievement scores in Mathematics, which follows a normal distribution. This means that most students' scores clustered around the average, with fewer students achieving very high or very low scores. The normal distribution pattern helped in understanding the overall performance trends and identifying areas where educational interventions might be necessary to support students who were struggling.

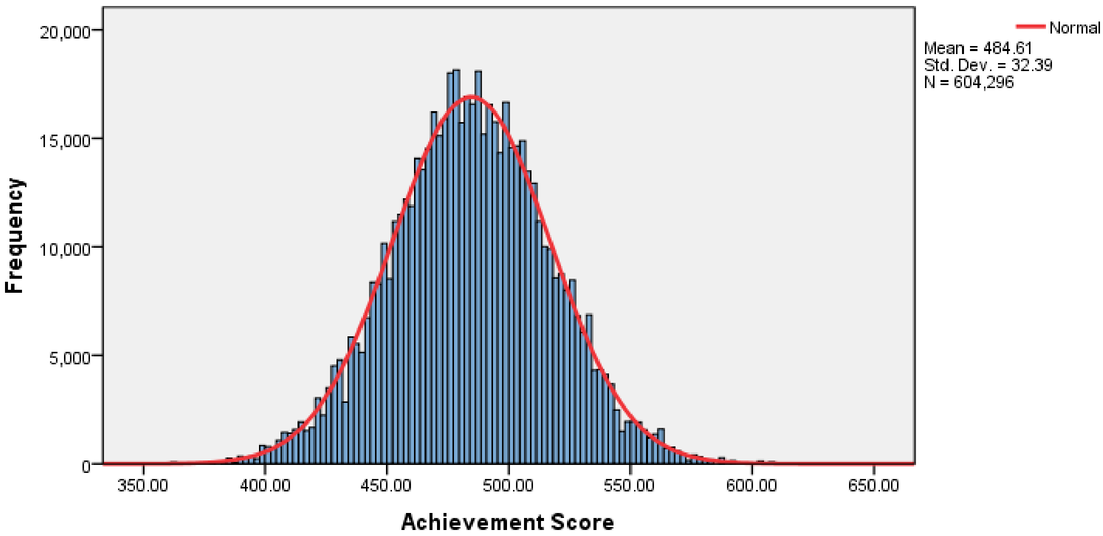

Figure 14 Distribution of achievement scores in Mathematics

Proficiency levels of students in Mathematics

Figure 15 illustrates the distribution of students across four proficiency levels in Mathematics. The data revealed that a mere 1.0% of students achieved an advanced level, indicating a very small proportion of students who excelled significantly. Approximately one-fifth of the students, or 21.2%, reached a proficient level, demonstrating a solid understanding of mathematical concepts.

A similar proportion of students, 20.5%, were at the pre-basic level, suggesting that these students are struggling with foundational mathematical skills. The majority of students, over half at 57.3%, were categorized at the basic level. This result indicated that while these students had some grasp of mathematical concepts, they were not yet proficient and might require additional support to improve their understanding and performance.

This distribution highlighted the need for targeted educational interventions to help students move from basic to proficient levels and to support those at the pre-basic level in building essential mathematical skills.

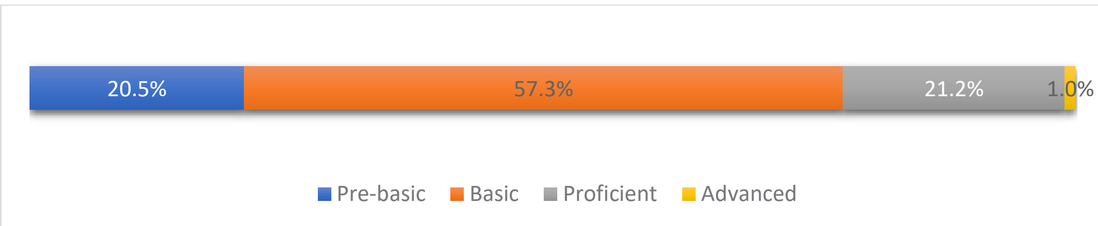

Figure 15 National Proficiency level of the students in Mathematics

Achievement scores in Mathematics by province

Figure 16 and Table 13 present the mean achievement scores in Mathematics for seven provinces. The figure includes a horizontal line representing the national mean score of 484.61, providing a benchmark for comparison.

The data revealed that the provinces of Koshi, Madesh, Bagmati, and Gandaki had mean scores above the national average. Specifically, Gandaki stood out with the highest mean score of 489.8, indicating a relatively stronger performance in Mathematics among its students.

Conversely, the provinces of Lumbini, Karnali, and Sudurpaschim had mean scores below the national average. Karnali, in particular, had the lowest mean score of 475, suggesting that students in this province might face more challenges in achieving higher Mathematics scores.

This distribution of scores highlighted regional disparities in Mathematics achievement, emphasizing the need for targeted educational strategies to support provinces that are lagging behind and to understand the factors contributing to the success of those performing above average.

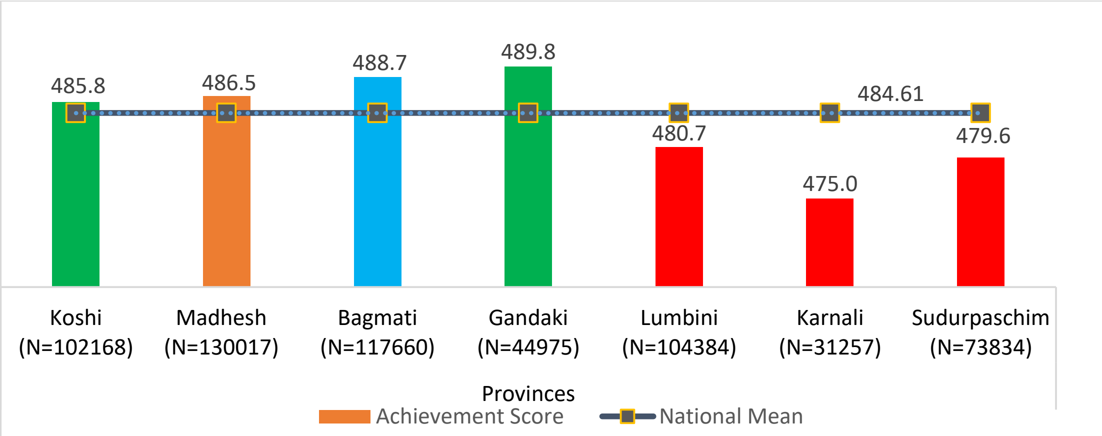

Figure 16 Proficiency level of students in Mathematics by province

In addition to analyzing achievement scores by province, the proficiency levels of students were also assessed based on these scores. The findings revealed that the majority of students across all provinces were categorized within the pre-basic and basic proficiency levels. This indicated that a significant number of students were struggling to achieve higher levels of mathematical understanding.

Madesh province stood out with the highest percentage of students reaching the advanced level, at 2.8%. This suggested that a small but notable portion of students in Madesh were excelling in Mathematics. On the other hand, Karnali province had the lowest percentage of students at the advanced level, with only 0.1% achieving this distinction. These results highlighted a considerable challenge in elevating student performance in this region.

These results underscored the need for targeted educational interventions to support students in provinces with lower proficiency levels and to understand the factors contributing to higher achievement in provinces like Madesh. By addressing these disparities, educational stakeholders can work towards improving overall student outcomes in Mathematics.

Table 13 Proficiency level-wise distribution of students in Mathematics based on provinces

Proficiency Level	Koshi	Madhesh	Bagmati	Gandaki	Lumbini	Karnali	Sudurpashchim
Pre-basic	17.3%	23.8%	14.4%	15.2%	23.6%	27.9%	24.3%
Basic	60.5%	49.0%	60.8%	59.1%	58.3%	59.8%	57.9%
Proficient	21.4%	24.4%	24.1%	25.1%	17.8%	12.2%	17.2%
Advanced	0.8%	2.8%	0.7%	0.7%	0.2%	0.1%	0.5%

Mathematics achievement score by local governance, types of school, gender and family types

This section presents the Mathematics achievement scores of students at the local government level. The results of the t-test, as shown in Table 14, indicated that students from Urban Municipalities had a significantly higher average achievement score (Mean = 486.49, SD = 32.12) compared to those from Rural Municipalities (Mean = 477.40, SD = 32.42). The difference was significant at 0.01 level of significance. This result suggested that students in urban areas might have better access to educational resources and opportunities.

The same table also revealed that students from institutional schools achieved significantly higher scores in Mathematics (Mean = 497.03, SD = 28.21) than those from community schools (Mean = 476.51, SD = 32.38). The difference between the average achievement scores between the institutional and community schools was statistically significant ($p < 0.01$). This difference highlighted the potential impact of school types on student performance, with institutional schools possibly providing more effective teaching methods or learning environments.

Additionally, the average achievement score for boys (Mean = 485, SD = 32.40) was slightly higher than that for girls (Mean = 484.54, SD = 32.32). Although the difference was small, but it was still statistically significant ($p < 0.01$). It suggested a gender disparity in Mathematics achievement that might need to be addressed.

Furthermore, the mean scores for students from rural municipalities, community schools, and girls were all below the national mean score. This result indicated that these groups might require additional support to reach the national average.

Lastly, the data showed that students from nuclear families had significantly higher achievement scores (Mean = 4.85.27, SD = 32.61) compared to those from other family types (Mean = 484.55, SD = 32.14), and the difference was statistically significant ($p < 0.01$). This finding suggested that family structure might play a role in student performance, with nuclear families potentially providing more stable or supportive environments for learning.

Table 14 Mathematics achievement score by local governance units, types of school, gender and family types

Variables	N	Mean	SD	SE	P-value
Local Level (n= 604296)					
Rural Municipality	124694	477.40	32.42	0.09	0.00
Urban Municipality	479602	486.49	32.12	0.05	
Types of institution (n= 604296)					
Institutional School	238698	497.03	28.21	0.06	0.00

Variables	N	Mean	SD	SE	P-value
Community School	365598	476.51	32.38	0.05	
Gender (n= 598871)					
Boys	304146	485.00	32.40	0.06	0.00
Girls	294726	484.54	32.32	0.06	
Family Types (n= 558012)					
Nuclear Family	230747	485.27	32.61	0.07	
Joint Family	327265	484.55	32.14	0.06	0.00

Proficiency level of students in Mathematics by types of local level

When assessing proficiency levels at the local government level (Figure 17), it was evident that a significant majority of students in both rural municipalities and urban municipalities fell within the basic proficiency level. Specifically, 57.4% of students in rural municipalities were at the basic level, compared to 56.8% of students in urban municipalities. This result indicated that over half of the students in both settings had a foundational understanding of Mathematics but had not yet reached proficiency.

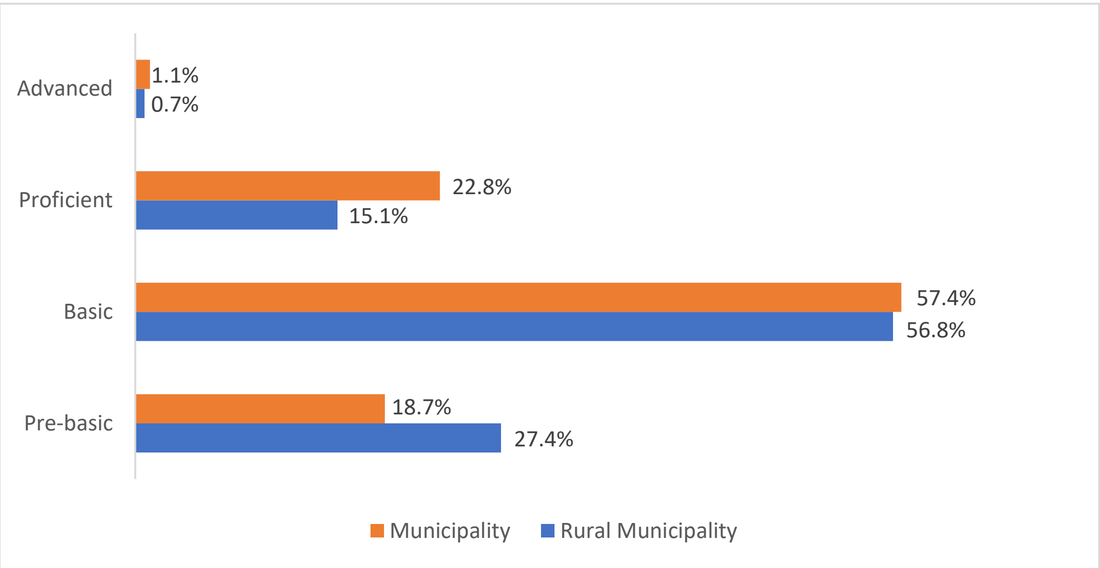

Figure 17 Proficiency level of students in Mathematics by types of local level

Proficiency level of students in Mathematics by school types

Furthermore, less than two percent of students in rural municipalities achieved an advanced proficiency level. This low percentage highlighted the challenges faced by students in rural areas in reaching higher levels of mathematical understanding. These findings suggested a need for targeted educational interventions to support students in both rural and urban settings, with a particular focus on helping those in rural municipalities achieve higher proficiency levels.

Figure 18 highlights a notable difference in Mathematics proficiency levels between institutional and community schools. The data showed that a higher percentage of students in institutional schools achieved advanced proficiency levels in Mathematics. This result suggested that these schools were more effective in helping students excel in this subject.

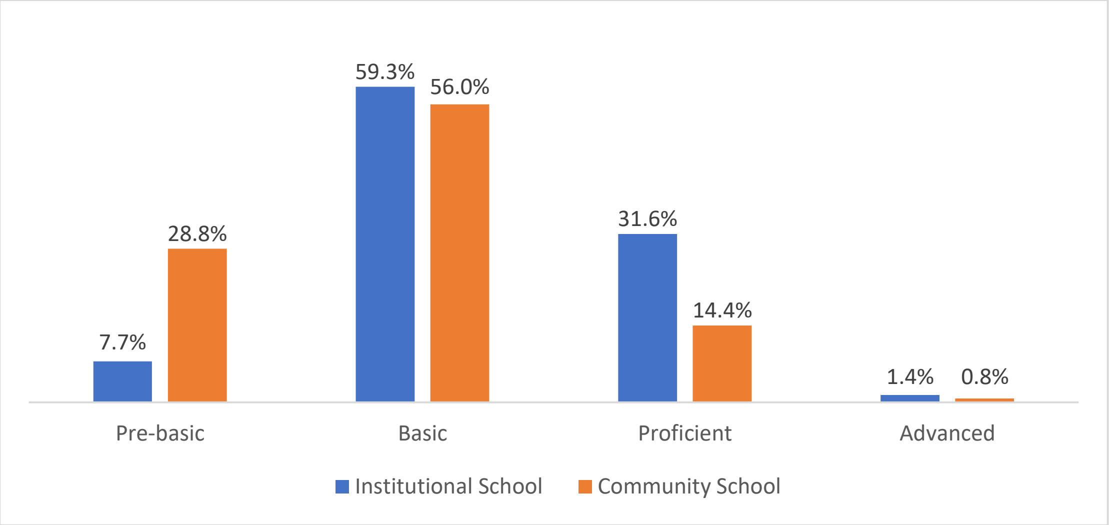

Figure 18 Proficiency level of students in Mathematics by school type

On the other hand, community schools had a larger proportion of students at the lower proficiency levels. This indicated that many students in these schools struggled with basic mathematical concepts and skills. The disparity between the two types of schools implied that community schools might lack the necessary resources, teaching methods, or support systems to enhance their students' performance in Mathematics.

To address this issue, community schools need to implement specific strategies and allocate resources aimed at improving Mathematics education. This could include professional development for teachers, access to better learning materials, and targeted interventions for students who are falling behind. By focusing on these areas, community schools could work towards closing the proficiency gap and ensuring that all students had the opportunity to succeed in Mathematics.

Mathematics achievement scores by ethnicity, geography, support to study and distance of school

The achievement scores of students were analyzed based on various background variables, including ethnicity, geography, support for study, and the distance of the school. This section presents the findings from this analysis, highlighting the significant differences in Mathematics achievement scores across these categories in Table 15.

Ethnicity was categorized into four groups: Brahmin/Chhetri, Janajati, Dalit, and other ethnicities. Additionally, ethnicity based on geography was divided into three categories:

Madheshi, Pahadi, and Himali. The distance to school was measured in five categories: up to 15 minutes, 30 minutes, 1 hour, 1-2 hours, and more than 2 hours. These categorizations provided a comprehensive framework for analyzing the impact of these variables on students' achievement scores.

The analysis of Mathematics achievement scores revealed significant differences across various categories, as presented in Table 15. When examining achievement scores with respect to ethnicity, Brahmin/Chhetri students led with the highest scores (Mean = 488.83, SD = 30.51), followed by other ethnicities (Mean = 487.08, SD = 34.76), Janajati (Mean = 485.22, SD = 31.89), and Dalit students (Mean = 479.26, SD = 32.28). This difference indicated a notable disparity in Mathematics achievement scores among different ethnic groups.

In terms of geography, Madhesi students achieved the highest scores (Mean = 487.19, SD = 33.28), significantly surpassing those of Mountain (Pahadi) (Mean = 485.61, SD = 30.94) and Himali (Mean = 485.41, SD = 30.10) students. However, post-hoc statistics showed that the difference in mean scores between Himali and Mountain students was not significant, suggesting that the geographical impact on achievement scores could be more nuanced.

Regarding study support, students without any support achieved the highest mean score (Mean = 489.43, SD = 31.74), followed closely by those receiving tuition (Mean = 488.46, SD = 35.02). These findings underscored the importance of self-motivation and independent study in achieving high academic performance.

Additionally, the distance to school played a significant role in students' achievement scores. Students with the shortest travel time to school (up to 15 minutes) had the highest achievement scores (Mean = 486.33, SD = 31.93), whereas those with travel times exceeding 2 hours had the lowest scores (Mean = 474.13, SD = 28.58). There was a gradual decrease in the achievement in Mathematics as the commute time increased. This difference highlighted the potential impact of travel time on students' academic performance, with longer travel times possibly leading to fatigue and reduced study time.

Table 15 Mathematics achievement score by ethnicity, geography, support to study and distance of school

Variables	N	Mean	SD	SE	p-value
Ethnicity (n=529604)					
Brahmin/Chhetri	211097	488.83	30.51	0.07	0.00
Janajati	191193	485.22	31.89	0.07	
Dalit	56960	479.26	32.28	0.14	
Other ethnicities	70353	487.08	34.76	0.13	
Geography (n=529604)					

Variables	N	Mean	SD	SE	p-value
Madheshi (Terai)	221864	487.19	33.28	0.07	0.00
Pahadi (Mountain)	290927	485.61	30.94	0.06	
Himali	16813	485.41	30.10	0.23	
Support to study (n=558600)					
Father	157323	484.42	32.65	0.08	0.00
Mother	114153	485.61	31.75	0.09	
Sibling	209936	485.97	31.50	0.07	
Tuition	37155	488.46	35.02	0.18	
Friends	27337	483.37	31.87	0.19	
None	12697	489.43	31.74	0.28	
Time to reach school (n=573690)					
Up to 15 min	369509	486.33	31.93	0.05	0.00
30 min	130430	485.62	32.29	0.09	
1 hour	47507	482.56	31.64	0.15	
1-2 hours	17168	478.97	33.06	0.25	
More than 2 hours	9077	474.13	28.58	0.30	

Mathematics achievement scores based on medium of instruction

The achievement scores of students, analyzed based on the medium of instruction and home language, reveal significant insights into academic performance. This section highlights the differences in Mathematics achievement when comparing home-speaking languages and the medium of instruction in schools.

According to the findings presented in Table 16, schools that used a local language other than Nepali or English as the medium of instruction achieved significantly higher scores (Mean = 488.12, SD = 35.40) compared to those using Nepali and English. This result suggested that instruction in a familiar local language could enhance students' understanding and performance in Mathematics. Additionally, students whose mother tongue was Nepali had a significantly higher mean score (Mean = 486.64, SD = 30.75) compared to those who spoke other languages at home (Mean = 483.25, SD = 34.42). The difference was statistically significant ($p< 0.01$). This result also indicated that students benefitted academically when their home language aligned with the medium of instruction, likely due to better comprehension and reduced language barriers. These findings underscored the importance of considering linguistic factors in educational strategies to improve student achievement.

Table 16 Mathematics achievement score based on the medium of instruction and home-speaking language

Variables	N	Mean	SD	SE	p-value
Medium of instruction (n=583838)					
Nepali	299953	483.96	32.81	0.06	0.00
English	119777	484.37	30.90	0.09	
Both	153186	486.03	32.31	0.08	
Other language	10922	488.12	35.40	0.34	
Home speaking language (n=563844)					
Other home language	228030	483.25	34.42	0.07	0.00
Nepali language	335814	486.64	30.75	0.05	

Mathematics achievement scores based on out-of-school time

This section reports the achievement scores of students based on the time they spent on various out-of-school activities, including using TV/internet/mobile devices (n = 529,603), playing with friends (n = 530,104), doing household chores (n = 520,315), studying/homework (n = 552,348), working for wages (n = 462,544), and supporting siblings (n = 509,571) (Table 17). The time spent on these activities was measured using a five-point rating scale: no time given, less than one hour, 1–2 hours, 2-4 hours, and more than 4 hours.

The analysis revealed that students who spent less than two hours on activities such as watching TV/internet/mobile (Mean = 488.31), playing with friends (Mean = 486.78), doing household chores (Mean = 486.86, and supporting siblings (Mean = 489.56) achieved higher mean scores. However, students who dedicated 2-4 hours to studying or doing homework showed even better academic results (Mean = 492.24). Conversely, students who spent increasing amounts of time working for wages had the lowest achievement scores and reached minimum for working longer than 4 hours (Mean = 475.66). This difference suggested that while moderate engagement in leisure and household activities was beneficial, excessive time spent on wage work could negatively impact academic performance. These findings highlighted the importance of balanced time management for students to optimize their academic success.

Table 17 Out of school activities of students and Mathematics achievement

Variables	Mean Achievement Scores				
	Time not given	Less than one hour	1-2 hours	2-4 hours	More than four hours
TV/Internet/Mobile (n=529603)	482.61	487.34	488.31	485.27	473.14

Variables	Mean Achievement Scores				
	Time not given	Less than one hour	1-2 hours	2-4 hours	More than four hours
Play with friends (n=530104)	483.16	486.77	486.78	484.42	478.53
Household chores (n=520315)	481.22	487.79	486.86	483.02	480.99
Study/homework (n=552348)	475.47	480.44	489.31	492.24	485.80
Work for wages (n=462544)	489.26	481.07	479.18	478.23	475.66
Support to siblings (n=509571)	485.01	486.04	489.56	485.85	479.72

Mathematics achievement scores based on engagement at school

The analysis of students' engagement at school, including leisure time activities, frequency of extracurricular activities (ECA), and participation in ECA, provides insightful findings on their academic performance (Table 18). Leisure time activities at school were categorized into classwork/homework, group work, playing, and having no leisure time. ECA activities and student participation were measured on a three-point rating scale: never, sometimes, and regular.

The analysis of Mathematics achievement scores revealed that students with no leisure time achieved the highest scores (Mean = 490.5, SD = 32.91), closely followed by those engaged in group work (Mean = 488.4, SD = 34.28). These results suggested that structured and academically focused leisure time positively impacted student performance. Post-hoc statistics confirmed significant differences between each category ($p < 0.01$). In contrast, students who spent their leisure time playing had the lowest scores (Mean = 478.3, SD = 32.30), indicating that less structured leisure activities might not contribute as effectively to academic success. These findings highlighted the importance of how students spend their leisure time at school and suggest that more academically oriented activities can lead to better academic outcomes.

Table 18 Mathematics achievement score based on activities at school

Activities in School		N	Mean	SD	SE	p-value
Leisure time activity at school (n= 567191)	Classwork/Homework	334804	484.9	31.14	.05	0.00
	Group work	61901	488.4	34.28	.14	
	Playing	67021	478.3	32.30	.12	
	Have no leisure time	103465	490.5	32.91	.10	

Activities in School		N	Mean	SD	SE	p-value
ECA Activities (n= 558547)	Regular	238504	485.4	32.84	.07	0.00
	Sometimes	304937	486.7	30.97	.06	
	Never	15106	474.6	34.36	.28	
ECA Participation (n= 578931)	Regular	232611	486.2	33.34	.07	0.00
	Sometimes	309544	485.4	31.49	.06	
	Never	36777	477.9	30.04	.16	

The analysis of extracurricular activities (ECA) revealed that students who participated occasionally achieved relatively higher scores (Mean = 486.7, SD = 30.97), with regular participants also performing well (Mean = 485.4, SD = 32.84), while those who never participated scored the lowest (Mean = 474.6, SD = 34.36). Similarly, for ECA participation, regular participants scored significantly highest (Mean = 486.2, SD = 33.34), followed by occasional participants (Mean = 485.4, SD = 31.49), with non-participants scoring the lowest (Mean = 477.9, SD = 30.04). The significance test indicated that students who regularly participated in ECA activities had significantly higher achievement scores than other students. Post-hoc statistics further confirmed significant differences between each category, favouring those with higher mean scores ($p<0.01$). These findings suggested that focused academic activities and balanced involvement in extracurricular activities were linked to higher academic achievement. Regular participation in ECAs not only enhances academic performance but also highlights the importance of a well-rounded educational experience. These results underscore the value of encouraging students to engage in ECAs to foster both academic and personal growth.

Mathematics achievement scores by parents' education

The analysis of Mathematics achievement scores based on the educational levels of students' parents revealed significant insights (Table 19). Using ANOVA to test the statistical significance, the findings indicated a clear advantage for students whose parents had higher educational qualifications. Specifically, students whose mothers held a master's degree or higher achieved the highest scores (Mean = 497.79, SD = 32.59), followed by those with mothers holding a bachelor's degree (Mean = 494.50, SD = 30.98). There was a noticeable increase in student scores starting from the parents with 12th-grade level (Mean = 491.36, SD = 29.73). Conversely, students with illiterate mothers exhibited relatively lower scores (Mean = 481.01, SD = 33.20). The post-hoc test confirmed significant differences between each category of mothers' education ($p < 0.01$), underscoring the impact of maternal education on student performance.

In terms of fathers' education, students performed the best when their fathers held a master's degree or higher (Mean = 485.28, SD = 32.51), Bachelor's degree (Mean = 485.32, SD = 32.35) or literate (Mean = 485.0, SD = 32.68). Slightly lower scores were observed for students whose fathers completed 12 grade (Mean = 483.49, SD = 32.51) and for those with illiterate fathers (Mean = 484.56, SD = 34.37). However, post-hoc statistics revealed insignificant differences between certain categories, such as illiterate fathers and those with grade ten education, literate fathers with grade ten and bachelor's degrees, and grade ten with bachelor's and higher qualifications. These findings highlighted the nuanced influence of parental education on students' academic achievement, emphasizing the importance of higher educational attainment among parents for better student performance.

Table 19 Mathematics achievement score by parents' education

Categories	Mother education (n=575174)				Fathers' education (n=567841)			
Qualification Levels	N	Mean	SD	SE	N	Mean	SD	SE
Illiterate	140088	481.01	33.20	0.09	76418	484.56	34.37	0.12
Literate	125158	482.60	32.54	0.09	104541	485.00	32.68	0.10
Up to 10 class	151503	483.92	31.33	0.08	163179	484.91	31.32	0.08
12 class	105788	491.36	29.73	0.09	148900	483.49	32.51	0.08
Bachelors	30943	494.50	30.98	0.18	41555	485.32	32.35	0.16
Masters or above	21695	497.79	32.59	0.22	33249	485.28	32.51	0.18
p-value	0.00				0.00			

Mathematics achievement scores by occupations of the parents

Figure 19 illustrates the examination of student achievement scores based on parental occupations, revealing significant disparities among different categories. The graphs showed that children whose parents were employed as teachers achieved notably higher scores, with mothers as teachers having a mean score of 490.48 and fathers as teachers having a mean score of 487.90. This result suggested that parental involvement in education, particularly from mothers, had a substantial positive impact on student performance.

Conversely, children of parents engaged in labour work exhibited the lowest achievement scores, with mothers in labour having a mean score of 481.57 and fathers in labour having a mean score of 482.55. These findings highlighted the considerable influence of parental occupation on academic outcomes, emphasizing that students benefit significantly when their parents, especially mothers, were involved in educational professions. On the other hand, occupations such as labour work and foreign employment might be linked to lower academic achievement, suggesting that the nature of parental work could affect the educational success of their children.

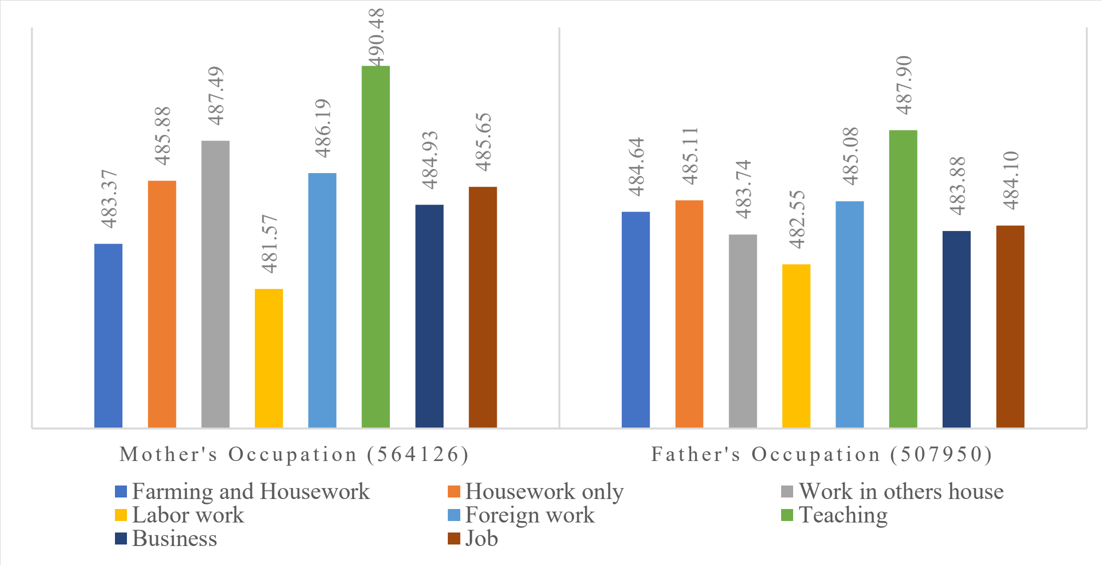

Figure 19 Mathematics achievement by parents' occupation

Mathematics achievement scores of students by facilities at home

Table 20 provides a detailed analysis of Mathematics achievement scores, highlighting the impact of various home facilities on student performance. Figure 20 complements this by illustrating the percentage availability of these facilities. The results revealed that all factors, except for the presence of literature books, significantly benefited students who had access to these resources. For instance, students with a separate room for studying achieved an average score of 485.54, compared to 484.12 for those without such a space. Similarly, having a quiet place to study slightly raised the mean score from 484.32 to 484.91. The presence of a computer at home also contributed positively, increasing the average score from 484.50 to 485.17. However, the most substantial improvement was seen with internet access, which boosts the average score from 483.67 to 486.62. These findings underscored the importance of a conducive home environment in enhancing students' academic performance in Mathematics.

Table 20 Mathematics achievement score by facilities at home

Facilities	Mean Achievement	
	No	Yes
Table for study	483.90	485.34
Separate room	484.12	485.54
Peace Place for study	484.32	484.91
Computer	484.50	485.17
Literature book	484.60	484.53

Facilities	Mean Achievement	
	No	Yes
Reference book	484.22	485.49
Nepali dictionary	484.50	485.11
Internet facility	483.67	486.62
Mobile	484.26	484.92

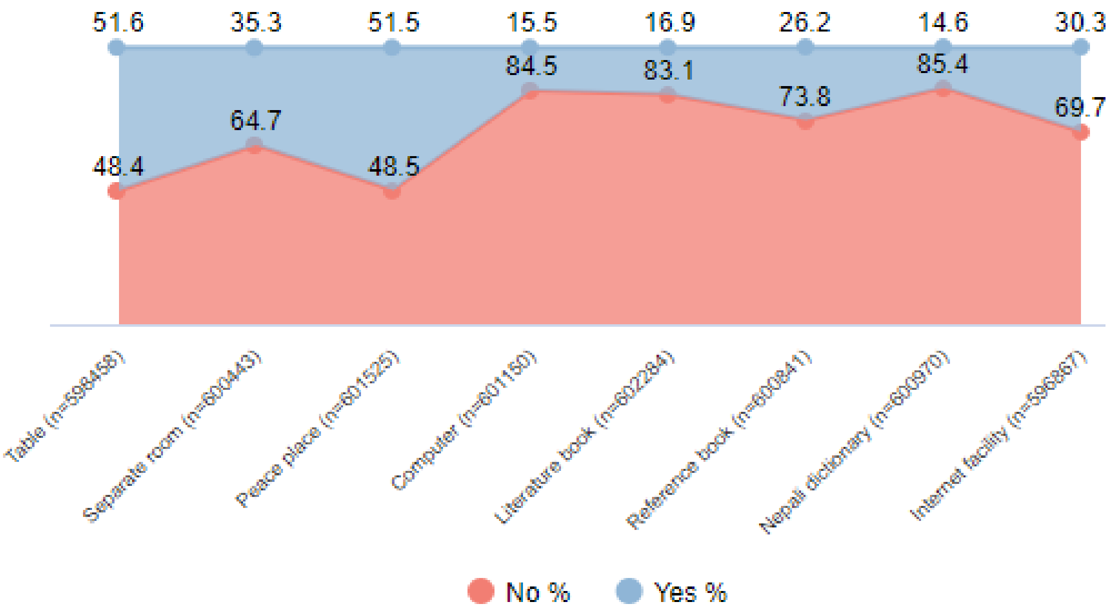

Figure 20 Availability of resources with students (participated in Mathematics test) at their home

Mathematics achievement scores based on teachers' activities

In this study, teachers' activities encompassed giving homework and feedback, maintaining regularity in the classroom, and managing time and punctuality. The frequency of giving homework and feedback, as well as classroom regularity, were assessed on a three-point rating scale ranging from "never" to "always." Meanwhile, time management and punctuality were categorized into three groups: full-time presence in the classroom, arriving late and leaving early, and infrequent classroom attendance. The mean scores were compared using ANOVA to determine the impact of these activities on student achievement.

The findings, as indicated in the study (Table 21), revealed that students whose Mathematics teachers consistently assigned homework achieved higher scores, with a mean of 485.0 (SD = 32.45), compared to those whose teachers sometimes assigned homework (Mean = 483.50, SD = 31.83) and those whose teachers never did assign (Mean = 479.90, SD = 34.01). Post-hoc statistics further confirmed significant differences between these groups (p < 0.01). Similarly, the provision of feedback from teachers showed a positive correlation with student performance. Students whose teachers consistently offered feedback had a mean score of 485.00 (SD = 32.76), followed by those who received feedback sometimes (Mean = 483.60, SD = 31.83) and those who never received feedback (Mean = 481.50, SD = 29.21). The post-hoc analysis also highlighted significant differences between these groups (p < 0.01).

Teacher attendance patterns also played a crucial role in student achievement. Students taught by teachers who regularly attended classes achieved (Mean = 484.80, SD = 32.55) significantly higher average scores compared to those taught by teachers who were never regular to the class (Mean = 479.30, SD = 31.76), and the difference was statistically significant (p < 0.01). Specifically, students whose teachers were present full-time in the classroom exhibited higher achievement scores (Mean = 484.90, SD = 32.45), while those with teachers who did not frequently attend class showed poorer results (Mean = 482.10, SD = 32.91). The post-hoc statistics reinforced these findings, showing significant differences between each category of teacher attendance (p < 0.01) (Table 21). These results underscored the importance of consistent teacher engagement and feedback in enhancing student academic performance.

Table 21 Mathematics achievement score based on teachers' activities

Teachers' activities	N	Mean	SD	SE	p-value
Homework (n=584673)					
Always	464052	485.0	32.45	.05	0.00
Sometimes	113508	483.5	31.83	.09	
Never	7113	479.9	34.01	.40	
Feedback (n= 576456)					
Always	451040	485.0	32.76	.05	0.00
Sometimes	116495	483.6	31.43	.09	
Never	8921	481.5	29.21	.31	
Regularity (n= 581185)					
Always	468777	484.8	32.55	.05	0.00
Sometimes	96554	483.8	31.84	.10	
Never	15855	479.3	31.76	.25	
Time management and punctuality (n= 575064)					
Full-time in the classroom	506401	484.9	32.45	.05	0.00
Late come and leave early	23666	483.0	29.63	.19	
Does not come frequently	44997	482.1	32.91	.16	

Mathematics achievement scores based on schools related factors

Table 22 revealed insightful data on students' perceptions of various educational factors and their corresponding impact on Mathematics achievement scores. A significant number of students held positive views regarding their teachers' activities, the school environment, the subject of Mathematics, and the process of learning Mathematics. Specifically, students who perceived their teachers' activities positively scored an average of 484.65 (SD = 32.26), slightly lower than the mean score of 485.04 (SD = 33.02) scored by those with negative perceptions. Positive perceptions of the school environment resulted in a mean score of 484.77 (SD = 32.28), compared to 484.01 (SD =32.71) for negative perceptions. Attitudes towards Mathematics also played a crucial role, with students holding positive attitudes achieving a mean score of 484.75 (SD = 32.29), while those with negative attitudes scored 483.32 (SD = 34.31), and the difference was significant ($p < 0.01$). Likewise, students who had positive attitudes toward Mathematics learning performed better (Mean= 484.76, SD = 32.28) than the students who expressed negative attitudes toward Mathematics learning (Mean = 482.74, SD = 33.35), and the difference was statistically significant ($p < 0.01$).

Engagement levels in lessons further influenced scores, with students engaged in every lesson achieving the highest mean score of 486.05 (SD = 46.76), followed by those engaged in about half the lessons (Mean = 485.21, SD = 48.98) and those engaged in some lessons (Mean = 482.88, SD = 50.66). Additionally, the impact of bullying on achievement was notable; students who reported no bullying scored an average of 486.51 (SD = 32.52), whereas those who experienced bullying scored 483.66 (SD = 32.20). All these results were statistically significant ($p < 0.01$), underscoring the importance of a positive educational environment and student engagement in enhancing academic performance.

Table 22 Achievement in Mathematics based on perception-related factors

Perceptions of students toward		N	Mean	SD	p-value
Teachers' activities	Negative	79705	485.04	33.02	0.00
	Positive	514970	484.65	32.26	
School's environment	Negative	58252	484.01	32.71	0.00
	Positive	532499	484.77	32.28	
Mathematics	Negative	53454	483.32	34.31	0.00
	Positive	536110	484.75	32.29	
Learning Mathematics	Negative	65274	482.74	33.55	0.00
	Positive	519162	484.76	32.28	
Engagement in the classroom	Never	17890	482.84	49.35	0.00
	Some lessons	153453	482.88	50.66	

Perceptions of students toward		N	Mean	SD	p-value
	About half lesson	320282	485.21	48.98	
	In every lesson	73124	486.05	46.76	
Bullying in school	No Bullying	216653	486.51	32.52	0.00
	Bullying	373043	483.66	32.20	

Figure 21 shows students experienced different forms of bullying in school, such as stealing things (26.90%), hurt by other students (23.90%), teased by other students (28.50%), and teased by others using nick names (34.10%). These and other forms of bullying may impact students' mental health and self-esteem in learning Mathematics.

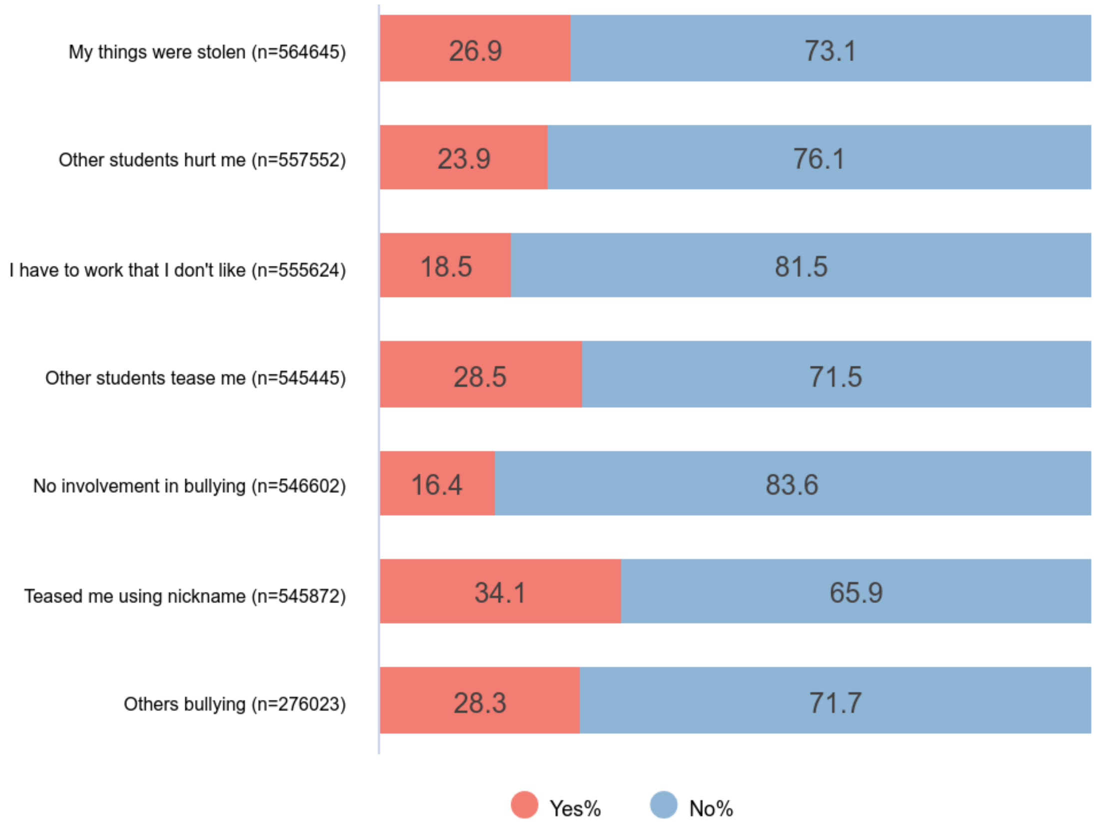

Figure 21. Percentage of students bullying in Mathematics class

Effect of individual, family and school factors on Mathematics achievement

Table 23 highlights the influence of various individual, family, subject-related, and perception-related factors on Mathematics achievement scores. The model accounted for 5% of the variance in scores, as indicated by a significant ANOVA test. Positive beta values signified factors that enhanced student achievement in Mathematics, while negative beta values denoted factors that hindered it. Notably, higher maternal education (Beta = 0.13), increased time spent on studying or doing assignment at home (Beta = 0.11), and the regularity of Mathematics teachers in the classroom (Beta = 0.03) positively contributed to students' Mathematics performance. Conversely, factors such as engagement in work for wages (Beta = -0.09), involvement in household chores (Beta = -0.03), and experiences of bullying in schools (Beta = -0.03) negatively impacted students' achievement. These findings underscored the multifaceted nature of academic performance, highlighting the importance of supportive family environments, dedicated study time, and consistent teacher presence, while also addressing the detrimental effects of external responsibilities and negative school experiences.

Table 23 Effect of individual and family, subject and students' perception-related factors on Mathematics achievement

Variables	B	SE	Beta	t	Sig.	VIF
(Constant)	457.83	0.91		504.24	0.00	
Mother Education	2.97	0.05	0.13	63.78	0.00	1.11
Work for Wages	-2.96	0.07	-0.09	-44.64	0.00	1.11
Study/Homework	3.09	0.06	0.11	51.59	0.00	1.15
ECA Participation	2.71	0.11	0.05	25.73	0.00	1.06
Math Teacher Regularity	2.23	0.13	0.03	16.77	0.00	1.07
Household Chores	-1.08	0.07	-0.03	-16.24	0.00	1.17
Bullying in School	-2.11	0.13	-0.03	-16.68	0.00	1.05
Engagement in Learning	1.35	0.09	0.03	14.30	0.00	1.05
Facilities for Study at Home	0.46	0.03	0.03	14.45	0.00	1.11
Math Teacher Feedback	1.49	0.14	0.02	10.77	0.00	1.08
Time to reach School	-0.71	0.07	-0.02	-9.74	0.00	1.01
TV/Internet/ Mobile	0.90	0.09	0.02	10.44	0.00	1.07
Perception Toward Teachers	-2.53	0.25	-0.02	-9.98	0.00	1.37
Learning Attitude Toward Mathematics	2.16	0.27	0.02	8.02	0.00	1.38
Father Education	-0.43	0.05	-0.02	-9.07	0.00	1.12
Medium of Instruction	0.62	0.07	0.02	8.92	0.00	1.08
Play with Friends	-0.59	0.08	-0.01	-7.27	0.00	1.09

Variables	B	SE	Beta	t	Sig.	VIF
Mathematics Teacher Classroom Regularity	0.74	0.12	0.01	6.10	0.00	1.09
Language	-0.87	0.13	-0.01	-6.57	0.00	1.09
Mathematics Textbook	1.20	0.23	0.01	5.15	0.00	1.05
Support to Siblings	-0.33	0.06	-0.01	-5.15	0.00	1.19
ECA Activities	-0.52	0.12	-0.01	-4.40	0.00	1.06
Perception Towards Schools	-1.33	0.31	-0.01	-4.30	0.00	1.51
Perception Towards Mathematics	0.92	0.32	0.01	2.90	0.00	1.52

CHAPTER FIVE

Students' Performance in Science and Technology

NASA Findings of Science and Technology

In evaluating students' performance in Science and Technology, two primary metrics were employed: "achievement score" and "proficiency level." The national achievement score, established at 500, served as a standard benchmark for comparison. Scores above 500 signified performance that surpassed the national average, while scores below 500 indicated performance that fell short of this benchmark. The range of scores typically spanned approximately 50 points above and below the average, reflecting the diversity in student performance relative to the national standard. This range highlighted the variations in students' understanding and mastery of scientific concepts, providing a comprehensive picture of their academic standing. The distribution of student achievement in science was approximately a normal distribution with a mean score of 500 and a standard deviation of 50 (Figure 22).

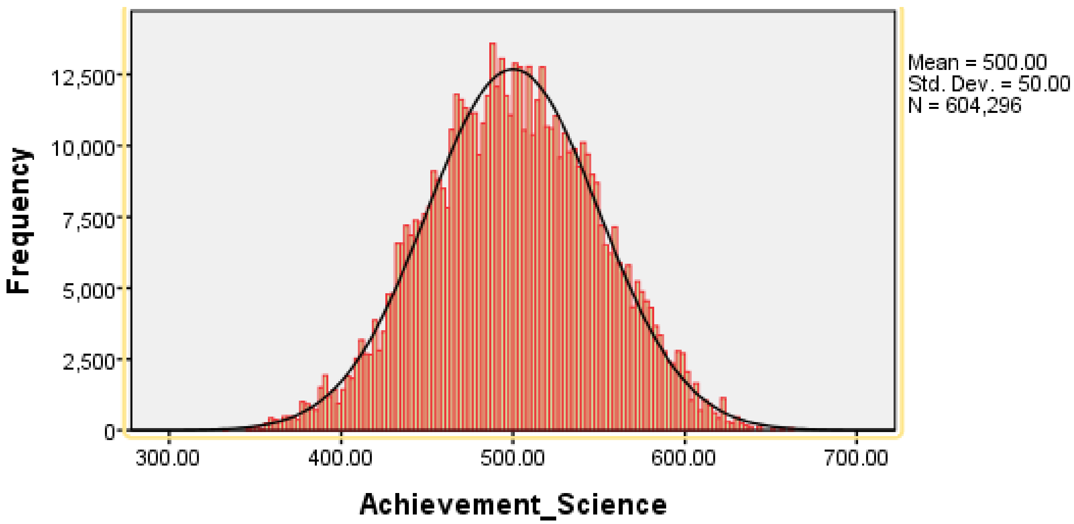

Figure 22 Science and Technology achievement score distribution curve

Proficiency levels of the students in Science and Technology

The national proficiency level of students in Science and Technology revealed a diverse distribution across various achievement levels. According to Figure 23, a small proportion of students fell into the pre-basic (4.2%) and advanced (6.1%) categories. In contrast, a significant majority of students were classified under the basic (43.1%) and proficient (46.6%) levels. This distribution highlighted that while a few students were either struggling significantly or excelling exceptionally, the bulk of the student population demonstrated a foundational to proficient understanding of scientific concepts. These insights underscored the importance of targeted educational strategies to support students at both ends of the spectrum, while also reinforcing the need to maintain and enhance the proficiency of the majority.

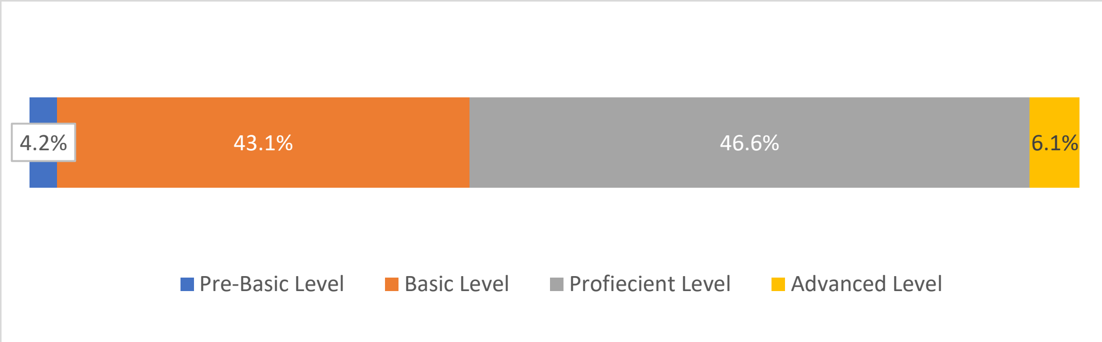

Figure 23 National proficiency level of the students in Science and Technology

Achievement score in Science and Technology by province

Figure 24 offers a detailed comparison of Science and Technology achievement scores among fifth-grade students across various provinces. Gandaki province led with the highest mean score of 518.16, while Madhesh province recorded the lowest mean score of 487.32. The data revealed that the achievement scores in Madhesh, Lumbini, and Karnali provinces fell below the national average, whereas Koshi, Bagmati, and Gandaki provinces exceeded this benchmark. The analysis using ANOVA and post-hoc statistics indicated that the differences in mean scores were statistically significant both within and between the provinces. This result suggested notable regional disparities in science education outcomes, highlighting areas that might require targeted interventions to improve student performance.

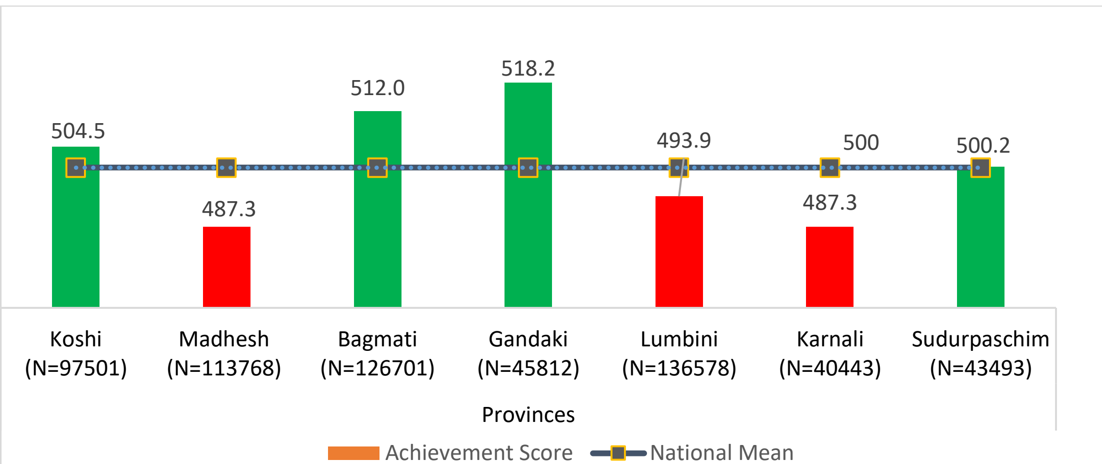

Figure 24 Average achievement score of Science and Technology by province

Proficiency level of students in Science and Technology by province

Figure 25 provides a comprehensive overview of the proficiency levels of fifth-grade students across various provinces, expressed as percentages. In Madhesh province, 7.7% of students were classified at the pre-basic level, the highest percentage among all provinces, while Gandaki province had the lowest percentage at 0.7%. Karnali province showed the highest percentage of students at the basic level, with 50.9%, whereas Gandaki province had the lowest at 31%. Gandaki province also stood out with the highest percentage of students classified as proficient, at 59.8%. In contrast, Bagmati province led in the advanced level category, with 9.8% of students. On the other end of the spectrum, Karnali province recorded the lowest percentage of students at the advanced level, at 3.4%, and Madhesh province had the lowest percentage of students classified as proficient, at 36.8%. These statistics highlighted significant regional variations in student proficiency levels, suggesting a need for targeted educational strategies to address these disparities.

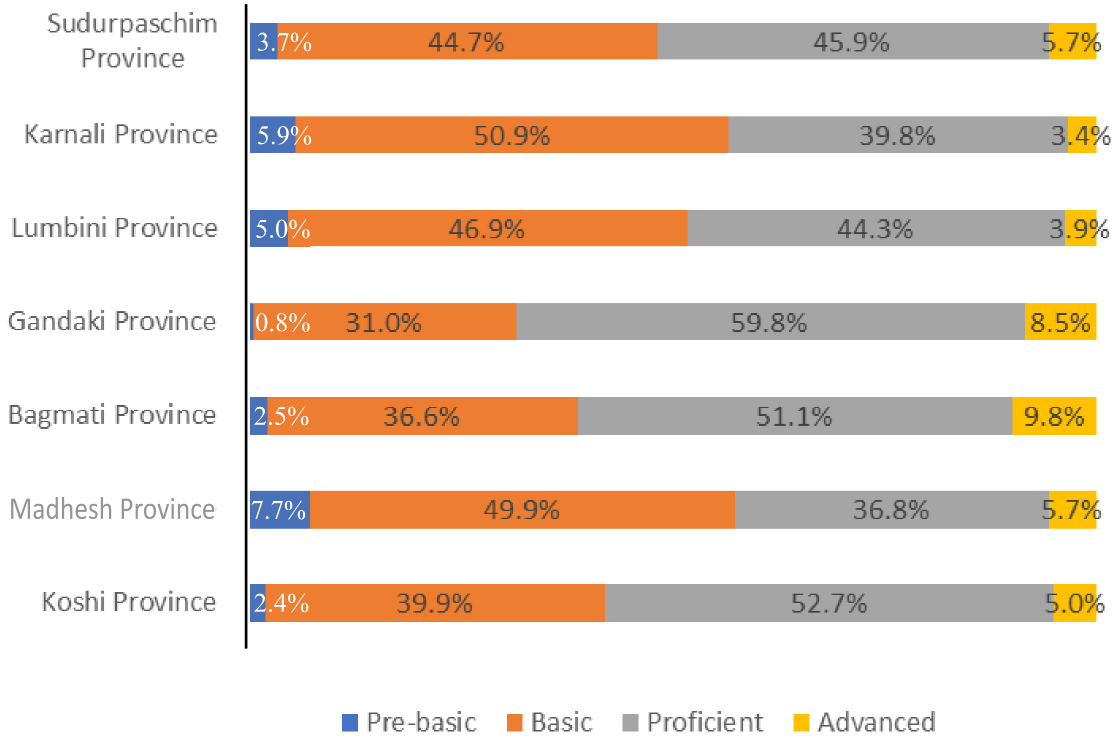

Figure 25 Proficiency level of student achievement scores in Science and Technology by province

Science and Technology achievement scores by local governance unit, types of school, gender and family types

This section presents the average Science and Technology achievement scores analyzed by local level, school type, and gender using an independent sample t-test. Table 24 revealed that the average achievement score in Science and Technology was significantly influenced by the local governance unit, with students in Urban Municipalities scoring (Mean = 503.39, SD = 50.34), notably higher than the average achievement of students in Rural Municipalities (Mean = 493.37, SD = 48.65), and the difference was statistically significant ($p < 0.01$). Additionally, students attending community schools had significantly lower achievement scores

(Mean = 493.37, SD = 48.65) than their peers in institutional schools (Mean = 518.20, SD = 48.73). The difference was statistically significant ($p < 0.01$). Gender differences were also evident, with boys outperforming boys in Science and Technology achievement (Mean for boys = 502.29, SD = 49.22; Mean for girls = 499.84, SD = 49.70). Furthermore, students from nuclear families exhibited significantly higher mean scores (Mean = 506.55, SD = 50.86) than those from joint families (Mean = 500.80, SD = 46.96) and the difference was statistically significant ($p < 0.01$). These findings highlighted the impact of local environment, school type, gender, and family structure on students' academic performance in Science and Technology.

Table 24 Science and Technology achievement score by local level, types of school, gender and family types

Variables	N	Mean	SD	SE	P-value
Local level (n=604296)					
Urban Municipality	399595	503.39	50.34	0.08	0.00
Rural Municipality	204701	493.37	48.65	0.11	
Types of institution (n=604296)					
Community School	381608	489.38	47.61	.08	0.00
Institutional School	222688	518.20	48.73	0.10	
Gender (n=593987)					
Boys	286824	502.29	49.22	0.09	0.00
Girls	307163	499.84	49.70	0.09	
Family types (n=555039)					
Nuclear	234386	506.55	50.86	0.10	0.00
Joint	320653	500.80	46.96	0.08	

Proficiency level of students in Science and Technology by local level

The analysis of proficiency levels, as detailed in Figure 26, revealed that over half of the students in both Urban Municipalities and Rural Municipalities had achieved the Basic and Proficient level. Additionally, the proportion of students at the Basic level is comparable between Urban and Rural Municipalities, suggesting a consistent distribution of foundational skills.

However, the data also highlighted that the percentages of students at the Pre-basic and Advanced levels were the lowest in both types of localities. This result suggested that while many students were reaching proficiency, there was a smaller number of students who were either struggling at the lower end or excelling at the higher end of the proficiency spectrum. This distribution pointed to potential areas for targeted educational interventions to support students at both ends of the performance scale.

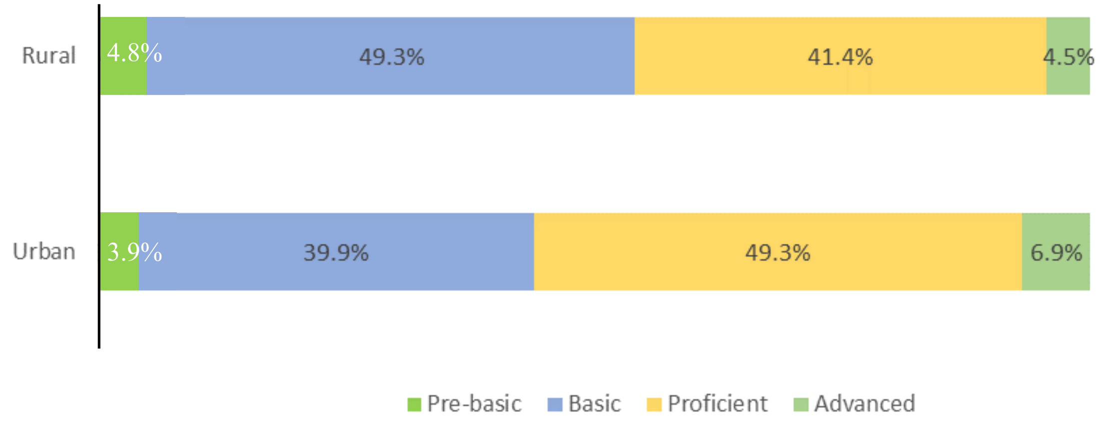

Figure 26 Proficiency level of students in Science and Technology by local level

Proficiency level of students in Science and Technology by school types

Figure 27 provides a detailed comparison of proficiency levels among fifth-grade students based on school types. It highlighted those students from institutional schools demonstrate a significantly higher proficiency at the Advanced level, with 10.8% achieving this status, compared to just 3.3% of students from community schools. This result suggested that institutional schools might offer more resources or effective teaching methods that help students excel in Science and Technology.

When examining the Proficient level, institutional schools again outperformed community schools, with 57.1% of their students reaching this level, compared to 40.5% in community schools in Science and Technology. This outcome also indicated a broader base of students achieving solid academic performance in institutional settings.

Conversely, community schools had a higher percentage of students at the pre-basic level (5.6% versus 1.9%) and the Basic level (50.6% versus 30.2%) compared to institutional schools. This disparity suggested that community schools might face challenges in elevating students beyond the foundational proficiency levels, potentially due to fewer resources or different educational approaches.

Overall, these findings underscored the need for targeted interventions in community schools to support students in reaching higher proficiency levels, while also recognizing the strengths of institutional schools in fostering advanced academic achievement in Science and Technology.

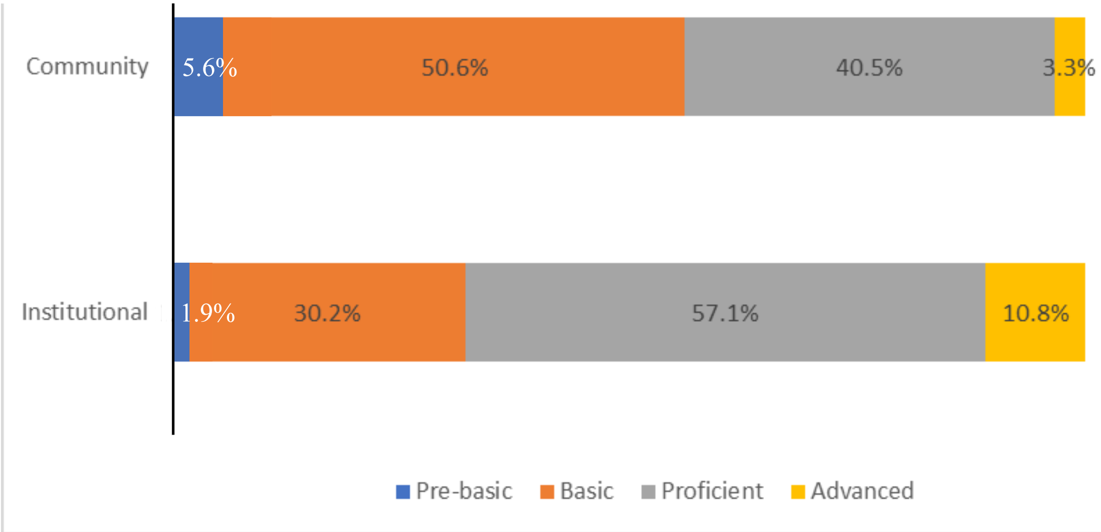

Figure 27 Proficiency level of students in Science and Technology by School type

Proficiency level of students in Science and Technology by gender

Figure 28 illustrates the proficiency levels of girls and boys in Science and Technology, revealing that both genders perform poorly at the Pre-basic and Advanced levels, with percentages ranging from 2.3% to 4.9%. This indicated a significant challenge in achieving either the lowest or highest proficiency tiers.

Approximately two-fifths of boys (42.1%) and girls (43.4%) were at the Basic level, showing a similar distribution of foundational Science and Technology skills between the genders. However, a slightly higher percentage of girls fell into this category compared to boys.

In contrast, at the Proficient level, 48.2% of boys and 46.2% of girls achieved this status. This result suggested that while boys slightly outperformed girls at this level, both genders had a substantial proportion of students reaching proficiency.

Overall, the data highlighted that while there was a notable gender parity at the Basic and Proficient levels, there was a need for targeted educational strategies to improve performance at both the lower and upper ends of the proficiency spectrum. This could involve additional support for students struggling at the pre-basic level and more advanced resources for those capable of reaching the Advanced level.

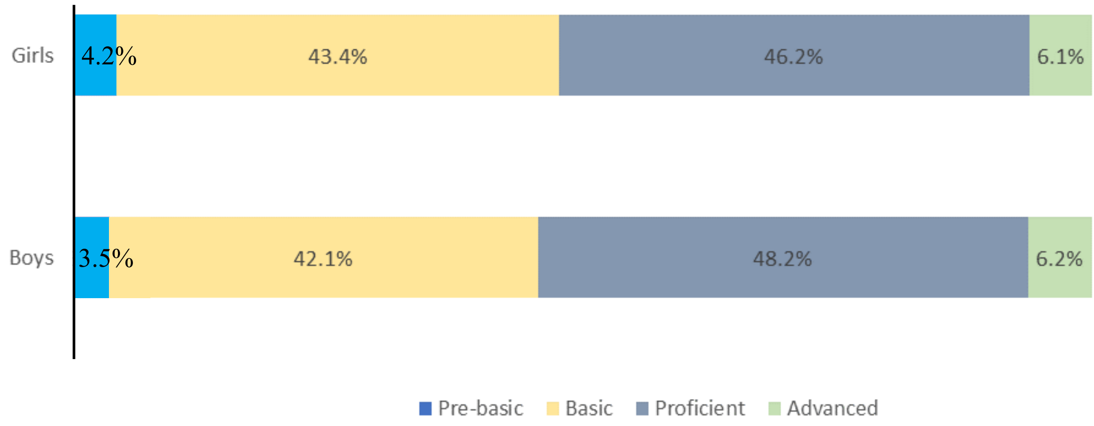

Figure 28 Proficiency level of students in Science and Technology by gender

Science and Technology achievement scores by ethnicity, geography, support to study, and distance of school

Table 25 presents the results of a one-way ANOVA analysis on Science and Technology achievement scores, considering factors such as ethnicity, geography, study support, and school distance. The data revealed several key insights:

Ethnicity: The Janajati group had an average achievement score of 500.24 (SD = 46.50), which was at the national average. In contrast, the Brahmin/Chhetri group scored above the national average (Mean = 515.54, SD = 47.74) while the 'other ethnic' group achieved an average score of 497.77 (SD = 52.51). The ANOVA and post-hoc statistics indicated significant differences in Science and Technology achievement scores both within and between these ethnic groups ($p < 0.01$).

Geography: Mountain (Pahadi) students outperformed the Terai (Madhesi) and Himali students. The mean achievement of Mountain students was 509.11 (SD = 47.38), while Terai students' average achievement was 498.58 (SD = 50.00), and Himali students' Science and Technology achievement was 498.58 (SD = 44.70). The analysis showed that geography significantly impacted achievement scores. However, post-hoc statistics revealed no significant difference between students from the Mountain (Pahad) and Himali regions in Science and Technology achievement.

School Distance: The distance from home to school also played a significant role in achievement scores. Students who travelled more than two hours to school had the lowest average score of 478.96 (SD= 46.53), while those with a commute of up to 15 minutes had the highest average score of 504.63 (SD= 49.27), which was above the national average in Science and Technology. There was a gradual decrease in student achievement in Science and Technology with the increase in the commute distance to the schools, and the differences were statistically significant ($p < 0.01$).

Study Support: The type of study support students received significantly affected their Science and Technology achievement scores. Students who received private tuition achieved a mean score of 506.19 (SD = 50.49) which was higher than those students who received support from their fathers (Mean = 498.08, SD = 49.78) or mothers (Mean = 504.51, SD = 50.73). Students who did not receive any support performed the best (Mean = 510.27, SD = 51.65) of all others who received some kinds of support in studying Science and Technology.

These findings highlighted the importance of considering various socio-demographic and logistical factors when addressing educational achievement disparities. Targeted interventions could help bridge these gaps and support students in achieving higher academic performance.

Table 25 Science and Technology achievement score by ethnicity, geography, support to study and distance of school

Variables	N	Mean	SD	SE
Ethnicity (n=455406)				
Brahmin/Chhetri	207836	515.54	47.74	0.10
Janajati	185084	500.24	46.50	0.11
Dalit	62486	488.70	45.04	0.18
Other ethnicities	71346	497.77	52.51	0.20
Geography (n=526752)				
Madheshi (Terai)	207604	498.58	50.00	0.11
Pahadi (Mountain)	299646	509.11	47.38	0.09
Himali	19502	498.58	44.70	0.32
Support to study (n=552697)				
Father	149324	498.08	49.78	0.13
Mother	119061	504.51	50.73	0.15
Sibling	215184	507.13	45.64	0.10
Tuition	33444	506.19	50.49	0.28
Friends	23107	489.09	46.84	0.31
None	12577	510.27	51.65	0.46
Time to reach school (n=569332)				
Up to 15 min	358648	504.63	49.27	0.08
30 min	125610	505.20	46.90	0.13
1 hour	52579	496.75	46.99	0.20

Variables	N	Mean	SD	SE
1-2 hours	21877	486.11	50.35	0.34
More than 2 hours	10618	478.96	46.53	0.45

Science and Technology achievement scores based on medium of instruction

Table 26 highlights the variations in students' Science and Technology achievement scores based on the language spoken at home. Students who spoke a language other than Nepali at home had a significantly lower average score (Mean = 486.91, SD = 49.62) compared to those who spoke Nepali at home (Mean = 508.87, SD = 48.28). This result suggested that language spoken at home played a crucial role in students' academic performance in Science and Technology.

Additionally, the medium of instruction at the students' institutions also impacted their achievement scores. Students who were taught in English had significantly higher scores (Mean = 522.40, SD = 48.51) compared to those taught in Nepali (Mean = 485.75, SD = 43.58) or other languages (Mean = 484.97, SD = 45.95), with the latter two groups scoring below the national average. Students who were instructed both in English and Nepali also achieved high in Science and Technology (Mean = 419.35, SD = 46.06) compared to students instructed in Nepali or other languages only. This result also indicated a clear advantage for students receiving instruction in English in Science and Technology classrooms.

The post-hoc statistics further confirmed significant differences in achievement scores across each category of the medium of instruction ($p < 0.01$). These findings underscored the importance of language in educational outcomes and suggested that enhancing language support could be a key strategy in improving Science and Technology achievement scores for students from diverse linguistic backgrounds.

Table 26 Science and Technology achievement score based on medium of instruction and home speaking language

Variables	N	Mean	SD	SE
Medium of Instruction (n=575767)				
Nepali	294081	485.75	43.58	.08
English	144839	522.40	48.51	.13
Both	127592	519.35	46.06	.13
Other Language	9255	484.97	45.95	.48
Home Speaking Language (n=604296)				
Other Home Language	244148	486.91	49.62	.10
Nepali Language	360148	508.87	48.28	.08

Science and Technology achievement scores based on spending time out of school

Table 27 illustrates the relationship between students' achievement scores and their out-of-school activities. The data revealed that students who spent 1-2 hours on TV and mobile devices achieved the highest average scores (Mean = 516.72), while those who abstained from these activities had the lowest scores (Mean = 485.54).

Similarly, students who did not spend time playing with friends had an average score of 485.43, whereas those who played for 1-2 hours scored higher, with an average of 508.68. Participation in household chores also showed a positive correlation with achievement scores: students who did not engage in chores score 481.49 on average, while those who spent 1-2 hours on chores achieved an average score of 511.03.

The time dedicated to study and homework significantly impacted achievement scores. Students who did not spend any time on these activities had the lowest average score of 473.43, while those who studied for more than four hours achieved the highest average score of 517.63.

Regarding wage work, students who did not engage in wage work had an average score of 503.87, compared to those who worked more than four hours scored lower with an average of 488.33. Lastly, students who did not care for siblings had an average score of 489.85, while those who spent 1-2 hours on sibling care achieved the highest scores in this category, with an average of 511.9.

Overall, the data suggested that students who balanced their time effectively across various activities, such as watching TV, socializing, and doing household chores, tended to achieve higher scores. Additionally, ANOVA and post-hoc analyses indicated significant differences in mean scores within and between each category of activities ($p < 0.01$).

Table 27 Science and Technology achievement score based on spending time out of school

Variables		Time not given	Less than 1 hour	1-2 hours	2-4 hours	More than 4 hours
Use Digital Resources (n=592099)	Mean	485.54	507.24	516.72	494.01	480.68
	N	191811	317456	63475	11339	8018
Play with Friends (n=591849)	Mean	485.43	505.20	508.68	502.94	492.64
	N	153861	306036	107373	15851	8728
Household Chores (n=589567)	Mean	481.49	505.35	511.03	501.49	491.25
	N	131507	222487	157887	50895	26791
	Mean	473.43	491.42	513.09	517.63	512.39

Variables		Time not given	Less than 1 hour	1-2 hours	2-4 hours	More than 4 hours
Study and Homework (n=587875)	N	135162	111751	165347	115238	60377
Work for Wage (n=5846888)	Mean	503.87	491.14	485.64	489.27	488.33
	N	447241	71981	27143	17600	20723
Support to Siblings (n=529318)	Mean	489.85	504.49	511.90	503.91	488.95
	N	192360	207952	122186	42696	25424

Science and Technology achievement score based on students' engagement at school

Table 28 provides a detailed analysis of how students' allocation of leisure time and participation in various activities impacted their achievement scores. The data indicated that students who did not have any leisure time achieved the highest average Science and Technology scores in science (Mean = 511.48, SD = 52.09). This was followed by students who dedicated their time to classwork and homework, with an average score of 505.06 (SD = 45.99).

On the other hand, students who engaged in group work had a lower average Science and Technology score of 498.53 (SD = 49.80), and those who spent time playing with friends scored even lower, with an average of 484.57 (SD = 48.14). When examining the frequency of participation in extracurricular activities (ECA), the data showed that students who occasionally participated in ECAs achieved the highest scores, with an average of 508.65 (SD = 47.15). Regular participation in ECAs resulted in slightly lower scores, with an average of 500.20 (SD = 48.87). Students who never engaged in ECAs had the lowest average scores, at 487.75 (SD = 45.99). Interestingly, occasional participation in ECAs yielded the highest scores in this category, with an average of 505.15 (SD = 46.81). The ANOVA and post-hoc analyses revealed significant differences in Science and Technology achievement scores across all three measured variables within and between the categories ($p < 0.01$), highlighting the impact of time management and activity engagement on student performance.

Table 28 Science and Technology achievement score based on students' engagement at school

Activities in School		N	Mean	SD	SE	p-value
Leisure time activity at school (n= 559860)	Classwork/Homework	331176	505.06	45.99	0.08	0.00
	Group work	60012	498.53	49.80	0.20	
	Playing	57103	484.57	48.14	0.20	
	Have no leisure time	111569	511.48	52.09	0.16	

Activities in School		N	Mean	SD	SE	p-value
ECA Activities (n= 555155)	Regular	241148	500.20	48.87	0.10	0.00
	Sometimes	297602	508.65	47.15	0.09	
	Never	16405	469.39	40.09	0.31	
ECA Participation (n= 570426)	Regular	227126	501.62	51.58	.11	0.00
	Sometimes	304313	505.15	46.81	.08	
	Never	38987	487.75	45.99	.23	

Science and Technology achievement score by parent's education

Table 29 provides a comprehensive analysis of the relationship between students' Science and Technology achievement scores and their parents' educational qualifications. The data revealed that students whose parents had attained a bachelor's degree (Mother: Mean = 533.14, SD = 50.21; Father: Mean = 527.11, SD = 51.48) or higher (including master's and above) (Mother: Mean = 535.93, SD = 52.15; Father: Mean = 538.13, SD = 51.91) exhibited significantly higher average achievement scores in Science and Technology compared to achievement of students whose parents had no education or lower than bachelor's degree. This trend underscored the positive influence that higher parental education levels could have on a student's academic performance.

In contrast, the data showed that students whose parents were either illiterate (Mother: Mean = 487.13, SD = 45.34; Father: Mean = 484.25, SD = 44.79) or possessed only basic literacy skills (Mother: Mean = 496.94, SD = 45.17; Father: Mean = 495.91, SD = 45.43), tended to have achievement scores that fell below the national average. This result suggested a considerable gap in academic performance based on the educational background of the parents, highlighting the challenges faced by students from less educated family backgrounds.

The results of the ANOVA and post-hoc statistical analyses further emphasized the significance of these findings ($p < 0.01$). These analyses indicated that there were substantial differences in mean achievement scores both within and between the various levels of parental education for both fathers and mothers. This meant that not only did the level of education of each parent individually impact the student's performance, but the combined educational background of both parents also played a crucial role.

Table 29 Science and Technology achievement score by parent's education

Categories	Mothers' education (n=565902)				Fathers' education (n=558059)			
	N	Mean	SD	SE	N	Mean	SD	SE
Illiterate	130968	487.13	45.34	0.13	74297	484.25	44.79	0.16
Literate	115926	496.94	45.17	0.13	96909	495.91	45.43	0.15
Up to 10 class	161412	501.33	46.44	0.12	159321	499.75	45.80	0.11
12 class	109072	515.17	49.09	0.15	154555	505.43	47.17	0.12
Bachelors	26943	533.14	50.21	0.31	39481	527.11	51.48	0.26
Masters or above	22665	535.93	52.15	0.35	34197	538.13	51.91	0.28
p-value	0.00				0.00			

Overall, the data from Table 29 and Figure 29 suggested that parental education was a critical factor in determining students' success in Science and Technology. Students with more educated parents tended to perform better academically, while those with less educated parents faced greater challenges in achieving high scores. This result highlighted the importance of educational support and resources for families to help bridge the achievement gap and promote equal opportunities for all students.

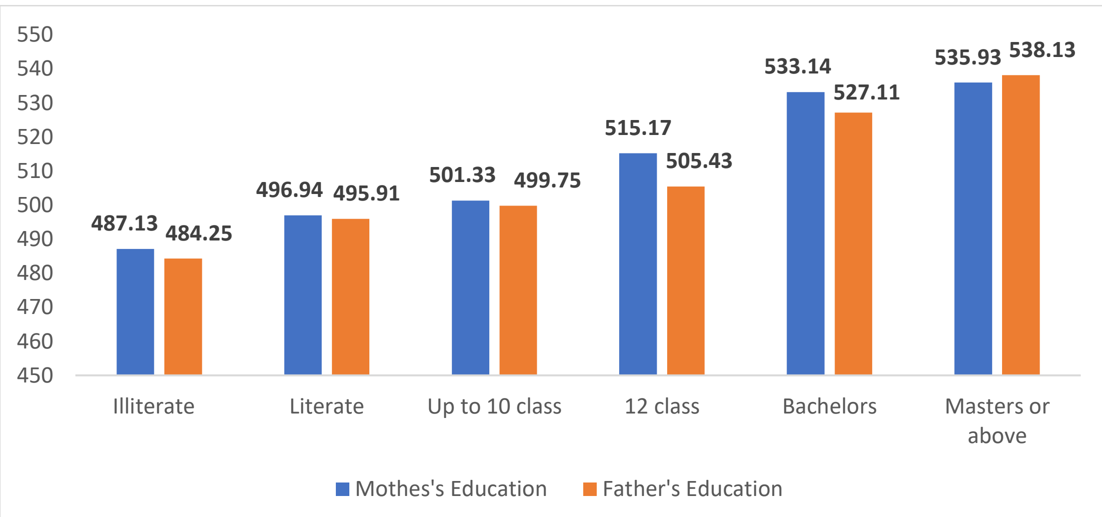

Figure 29 Science and Technology achievement score by parent's education

Science and Technology achievement scores by occupations of the parents

Table 30 highlights the impact of parents' occupations on students' achievement scores. Students whose mothers were involved in "Farming and Housework" or "Work in Others' Houses" tended to score below the national average. On the other hand, students with mothers in the teaching profession achieved the highest scores, with a mean of 531.61 (SD = 51.83). Following closely were students whose mothers were employed in jobs (Mean = 521.86, SD= 52.44) and businesses (Mean = 520.04, SD = 48.38).

Table 30 also shed light on the influence of fathers' occupations on students' performance. Students whose fathers were in the category "Work in Others' Houses" (Mean= 485.72, SD= 41.05), "Housework Only" (Mean = 480.82, SD = 46.94), and "Farming and Housework" (Mean = 486.51, SD = 44.02) scored below the national average. In contrast, students with fathers in public or private jobs achieved the highest scores, with a mean of 519.12 (SD= 50.33), followed by those in teaching (Mean = 516.29, SD = 54.07) and business (Mean = 516.29, SD = 48.08). Additionally, students whose fathers were engaged in labor work (Mean= 502.48, SD = 46.55) and foreign work (Mean = 503.59, SD = 46.41) scored slightly above the national average.

Interestingly, the results showed no significant difference between the scores of students whose mothers were involved in labor and foreign work, as well as between those whose fathers were in teaching and business professions.

Table 30 Science and Technology achievement score by occupations of the parents

Job Categories	Mothers' occupation (n=552442)			Fathers' occupation (n=510691)		
	N	Mean	SD	N	Mean	SD
Farming and Housework	280684	493.23	45.03	147157	486.51	44.02
Housework Only	163665	507.50	48.94	22465	480.82	46.94
Work in Others House	7964	487.63	45.23	11239	485.72	41.05
Labor Work	12013	502.61	47.51	43552	502.48	46.55
Foreign Work	14234	505.59	49.98	134182	503.59	46.41
Teaching	20431	531.61	51.83	21348	516.57	54.07
Business	38326	520.04	48.38	89469	516.29	48.08
Job	16039	521.86	52.44	41970	519.12	50.33
P-value	0.00			0.00		

Science and Technology achievement scores by facilities at home

Figures 30 and 31 provide a comprehensive analysis of how various home facilities influenced student performance, utilizing an independent sample t-test for accuracy. The data clearly indicated that students who had a dedicated room for studying achieved significantly higher Science and Technology achievement scores, with an average achievement score of 508.64, than those who did not have such room at home. Likewise, students who had references books to study Science and Technology achieved the highest (Mean= 508.99). This stark difference underscored the critical role that a conducive study environment played in academic success in Science and Technology.

Moreover, the presence of a computer at home was another significant factor contributing to better student performance. Students with access to a computer demonstrated markedly higher achievement scores (mean= 506.55) in Science and Technology compared to those without this resource (mean= 498.80). This result highlighted the importance of technology in facilitating learning and providing students with the tools they need to excel in Science and Technology

In addition to these factors, the availability of a quiet place for study, along with access to literature and reference books, also correlated with significantly higher achievement scores in Science and Technology (Figure 30). These results suggested that a peaceful and resource-rich environment was crucial for effective studying and academic excellence. However, the data showed that the availability of a Nepali dictionary did not significantly impact student performance, indicating that not all resources had the same level of influence on students' Science and Technology achievement.

Furthermore, the analysis revealed that students who lacked these essential facilities tended to score below the national average. This finding emphasized the disparity in educational outcomes, especially Science and Technology achievement, based on home environments and highlighted the need for equitable access to conducive study conditions for all students. Overall, the data from Figures 30 and 31 underscored the profound impact that a supportive home environment could have on a student's academic journey in Science and Technology.

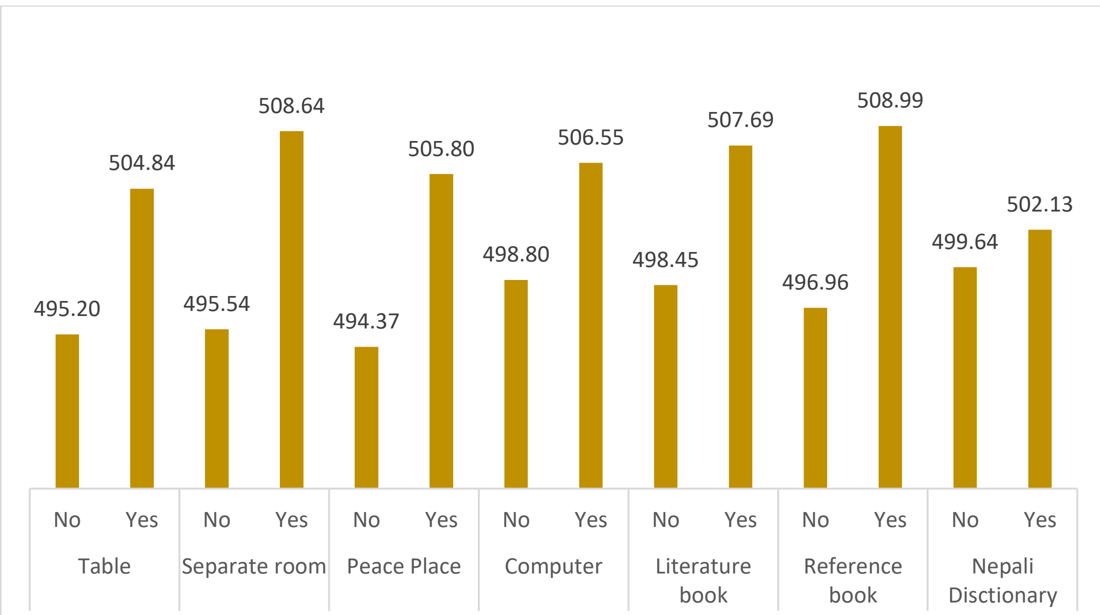

Figure 30 Science and Technology achievement score based on facilities at home

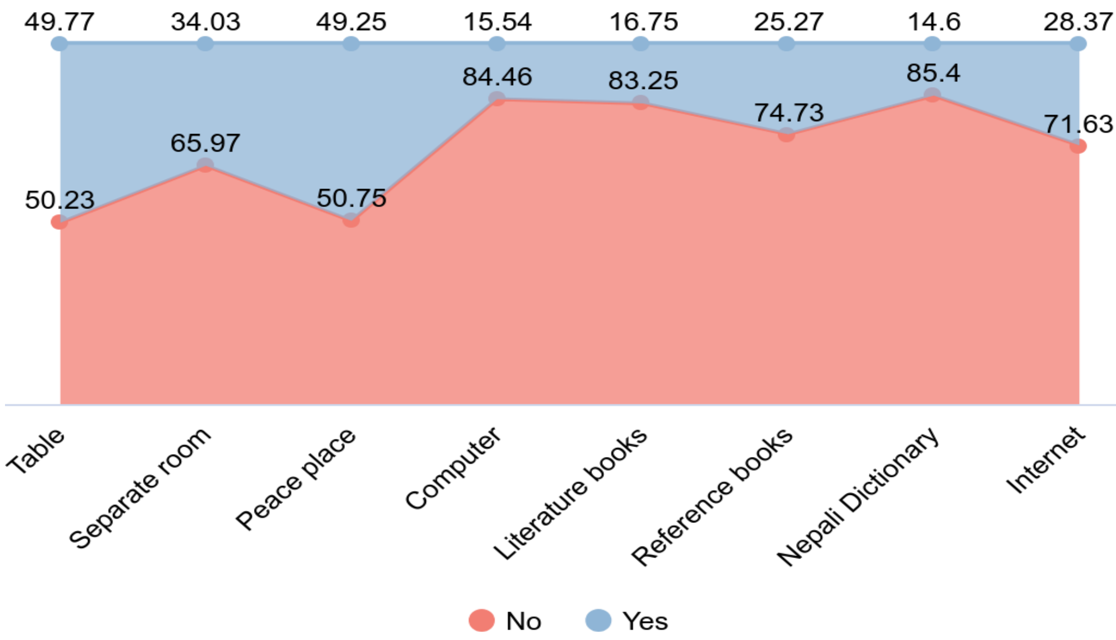

Figure 31 Frequency of availability ability of resources (students participated in Science and Technology test) at home.

Science and Technology achievement scores based on teachers' activities

Table 31 provides a detailed analysis of how various teacher activities influenced student performance. The data revealed that students achieved the highest scores when homework was assigned occasionally, with a mean score of 509.45 (SD = 48.47). This result suggested that a balanced approach to homework was more effective than assigning it either always or never.

Regular feedback from teachers was another critical factor that significantly enhanced student performance. The highest score, with a mean of 505.21 (SD = 48.54), was observed when feedback was consistently provided. On the other hand, the students who never received any feedback in Science and Technology performed the lowest (Mean = 468.88, SD = 42.60). This outcome also underscored the importance of continuous and constructive feedback in supporting student learning of Science and Technology.

Teacher regularity also played a vital role in student achievement. The analysis showed that students performed the best when teachers were sometimes regular, with a mean score of 510.81 (SD= 49.62). This was followed by always regular (Mean = 501.53, SD = 48.02), while the worst performance was noted when teachers were never regular (Mean = 475.64, SD = 45.95). These outcomes indicated that while consistency was important, occasional flexibility might also benefit student outcomes due to independent study in Science and Technology.

Time management and punctuality were crucial aspects of effective teaching. Students scored the highest, with a mean of 505.37 (SD= 48.50), when teachers spent the full allotted time in the classroom. In contrast, student performance declined when teachers were late or frequently absent, highlighting the importance of teacher presence and engagement.

The analysis, supported by ANOVA and post-hoc statistics, revealed significant differences within and between each category of the measured variables ($p < 0.01$). These findings emphasized the multifaceted nature of teaching practices and their profound impact on student performance in Science and Technology.

Table 31 Science and Technology achievement score based on teachers' activities

Teacher's Activities	N	Mean	SD	SE	p-value
Homework (n=574071)					
Always	383199	499.43	48.42	0.08	0.00
Sometimes	180516	509.45	48.47	0.11	
Never	10356	480.02	53.00	0.52	
Feedback (n=566441)					
Always	421716	505.21	48.54	.07	0.00
Sometimes	130516	497.98	47.84	.13	
Never	14209	468.88	42.60	.36	
Regularity (n=571753)					
Always	452976	501.53	48.02	.07	0.00
Sometimes	103989	510.81	49.62	.15	
Never	14788	475.64	45.95	.38	
Time management and punctuality (n=569106)					
Full Time in Classroom	503675	505.37	48.50	.07	0.00
Late come and leave early	26692	485.21	46.25	.28	
Does not come Frequently	38739	481.17	43.48	.22	

Science and Technology achievement scores based on subject, teacher, and school environment

This section delves into the achievement scores based on students' self-reported perceptions of various aspects of their educational experience, including their attitudes towards teachers, school, subjects, learning activities, and experiences with bullying.

Table 32 provides a detailed analysis, showing that students who held a positive attitude towards their teachers, learning processes, subjects, and practice sessions tended to achieve significantly higher scores in Science and Technology. This correlation underscored the importance of fostering a positive and engaging educational environment, where students felt motivated and supported in their academic pursuits.

Moreover, the data highlighted a stark contrast in Science and Technology achievement scores between students who did not experience bullying (Mean= 506.51, SD= 46.46) and those who did (Mean= 498.44, SD= 50.71). Students who were free from any form of bullying at school consistently performed better academically. This finding emphasized the detrimental impact that bullying could have on a student's academic performance in Science and Technology (and possibly other subjects) and overall well-being.

Despite the clear benefits of a bullying-free environment, the data revealed a concerning statistic: between 17.6% and 34.3% of students reported experiencing various forms of bullying at school (Figure 32). This significant percentage indicated a pressing need for schools to implement effective anti-bullying policies and create a safe, inclusive environment for all students. Positive perceptions of students toward teachers, school, Mathematics as a subject, and Mathematics learning had mean scores greater than national average (Mean= 500, SD= 50), where negative perceptions had lower scores below the national average.

Table 32 Average Science and Technology achievement score based on subject, teacher and school environment

Variables	N	Mean	SD	p-value
Perception of students towards teachers (n=592460)				
Negative	8833	481.03	46.38	0.00
Positive	583627	501.25	49.61	
Perception of students towards school (n=586873)				
Negative	8220	480.52	45.88	0.00
Positive	578653	501.82	49.16	
Perception towards subject (n=582596)				
Negative	6243	471.98	46.91	0.00
Positive	576353	502.04	49.12	
Perception Towards Learning (n=574135)				
Negative	6404	474.90	43.61	0.00
Positive	567731	502.69	48.84	
Perception towards practice (n=583608)				
Never	1836	447.53	35.87	0.00
Some lessons	9334	491.73	46.25	

Variables	N	Mean	SD	p-value
About half lesson	197286	507.22	50.36	
In every lesson	375152	498.79	48.64	
Bullying activities (n=586154)				
No Bullying	212731	506.51	46.46	0.00
Bullying	373423	498.44	50.71	

Overall, the analysis in this section highlighted the profound influence that positive perceptions of teachers, learning, and school, as well as the absence of bullying, had on student achievement. It underscored the necessity for educational institutions to prioritize creating a supportive and positive atmosphere to enhance student performance and well-being.

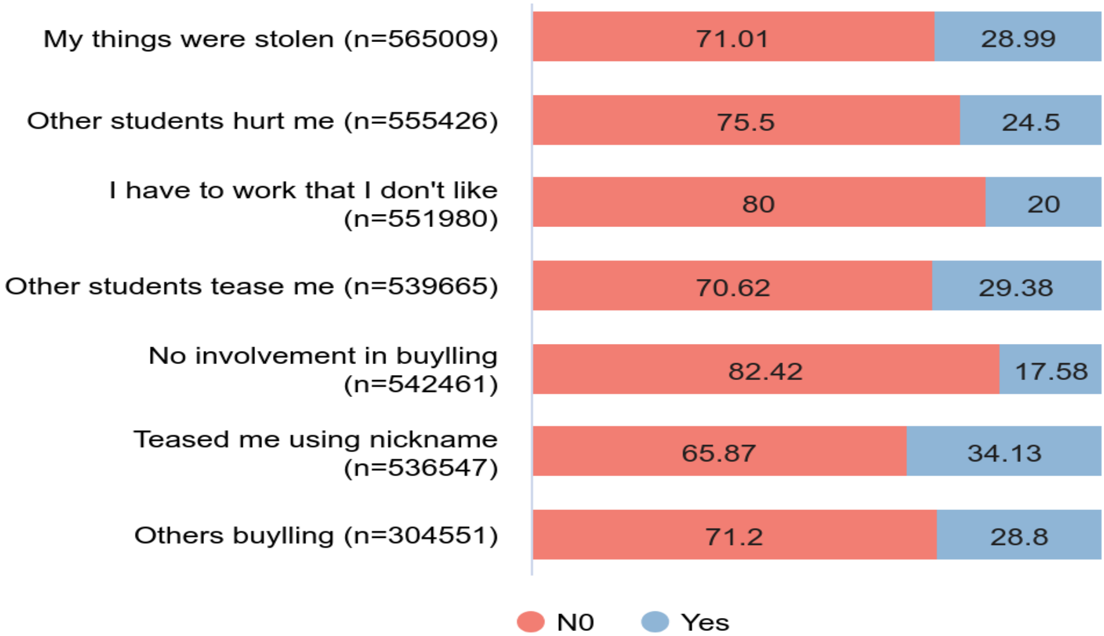

Figure 32 Number of students facing bullying activities in school

Effect of personal, family, and school related factors on Science and Technology achievement

Table 33 provides a detailed analysis of how personal, family, and school-related factors influenced Science and Technology achievement scores. A multiple linear regression model was employed to determine these effects, explaining 20% of the variance in scores, with the model showing significant results through ANOVA.

The table highlights several key factors that positively impacted Science and Technology achievement scores. Among these, home facilities stood out as the most significant positive predictor, with a beta value of 0.194. This was followed by the amount of time allocated for study and homework (Beta=0.158) and the educational level of the mother (Beta=0.103). These factors, having higher beta values, indicated their profound positive influence on student achievement.

Conversely, the time students spent working for wages emerged as the main negative predictor of Science and Technology achievement, with a beta value of -0.09. This suggested that the more time students spent working out, the lower their Science and Technology achievement scores tended to be.

Additional positive predictors included the father's education level, the regularity of the Science and Technology teacher in the classroom, students' perceptions of their teachers and learning, and the availability of facilities at home. These factors collectively contributed to better Science and Technology achievement scores.

On the other hand, family types and experiences of bullying were identified as additional negative predictors. These factors negatively impacted students' Science and Technology achievement, highlighting the importance of a supportive family environment and a safe school atmosphere for academic success.

Overall, the analysis in Table 33 underscored the multifaceted nature of factors influencing Science and Technology achievement, emphasizing the significant roles of home environment, parental education, teacher regularity, and the absence of negative influences such as excessive work hours and bullying.

Table 33 Effect of personal, family, and school related factors in Science and Technology achievement

Variables	B	SE	Beta	t	VIF
(Constant)	424.691	1.382		307.411	
Facilities at Home	6.170	.053	.194	115.974	1.387
Study/Homework	6.060	.060	.158	101.805	1.196
Mother Education	3.566	.065	.103	54.676	1.746
Work for Wages	-4.560	.073	-.094	-62.408	1.123
Science and Technology Teacher's Classroom Regularity	7.198	.138	.076	52.195	1.058
Science and Technology Textbook	10.323	.233	.064	44.233	1.045
Facilities for Study at Home	1.337	.036	.057	37.044	1.181
Family Type	-5.091	.135	-.054	-37.683	1.021

Variables	B	SE	Beta	t	VIF
Science and Technology Teacher's Feedback	5.711	.147	.059	38.741	1.142
Science and Technology Teacher Homework	-5.191	.140	-.057	-37.201	1.164
Bullying at School	-4.947	.140	-.052	-35.389	1.053
Support to Study	1.978	.057	.050	34.941	1.032
Father Education	1.988	.067	.056	29.627	1.771
Time to Reach School	-2.225	.074	-.043	-30.254	1.020
Perception Towards School	11.128	.696	.028	15.992	1.544
ECA Participation	-2.236	.116	-.028	-19.229	1.082
ECA Activities	-1.979	.130	-.023	-15.188	1.094
Learning Attitude Toward Science and Technology	7.439	.892	.015	8.344	1.643
Leisure Time Activity	.493	.054	.013	9.072	1.015
Household Chores	-.667	.071	-.015	-9.424	1.205
Science and Technology Teacher Regularity	-1.136	.149	-.011	-7.619	1.106
Engagement in Learning	5.737	.763	.011	7.520	1.013
TV/Internet/Mobile	.456	.094	.007	4.862	1.116
Attitude Towards Teachers	-2.866	.681	-.007	-4.206	1.291
Perception Towards Science and Technology	3.409	.948	.007	3.595	1.896
Support to Siblings	.173	.069	.004	2.517	1.239

CHAPTER SIX

Students' Performance in Nepali

National Mean Achievement scores in Nepali

The national mean achievement score for students in the Nepali subject was determined using anchor items from NASA 2018. For the 2022 assessment, these items were calibrated by fixing their parameters, with discrimination and difficulty levels calculated based on the 2018 data. To ensure accuracy, the differential item functioning method was employed to identify both uniform and non-uniform items. Once the appropriate items were confirmed, calibration was performed. The results from NASA 2022 revealed that the mean transformed scale score in Mathematics was 498.99 (SD = 47.42), which is slightly below the mean achievement score of 500 from NASA 2018. This indicates a slight decline in performance over the four years. The distribution of the scores in Nepali is nearly normal (Figure 33).

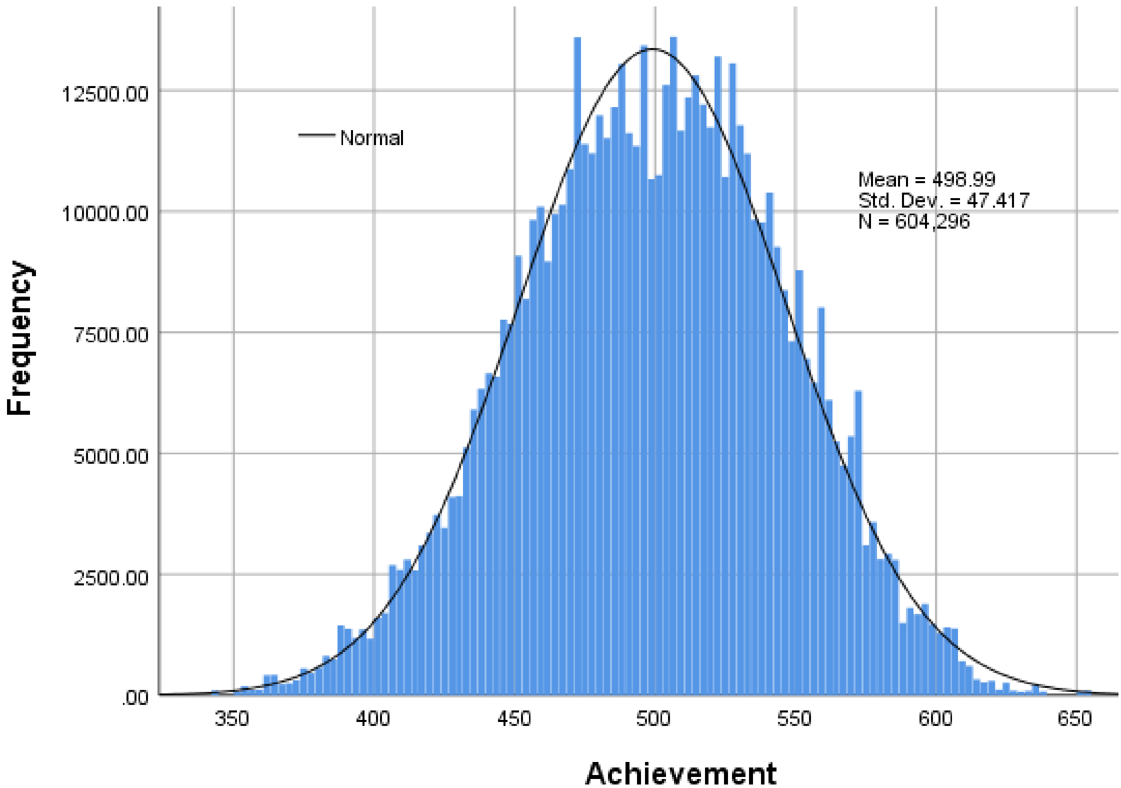

Figure 33 Distribution of achievement score of Nepali

Proficiency level of the students in Nepali

Proficiency levels were categorized into four distinct groups based on achievement scores: pre-basic, basic, proficient, and advanced. According to Figure 34, nearly half of the students fell into the basic (46%) and proficient (45.30%) categories, indicating a significant concentration of students within these middle proficiency levels. In contrast, a smaller percentage of students were at the extremes, with 3.20% at the pre-basic level and 5.50% at the advanced level. This distribution highlighted the need for targeted educational strategies to support students at both ends of the proficiency spectrum, ensuring that those at the pre-basic level receive the necessary resources to improve, while those at the advanced level were sufficiently challenged to continue their academic growth, especially in Nepali language study.

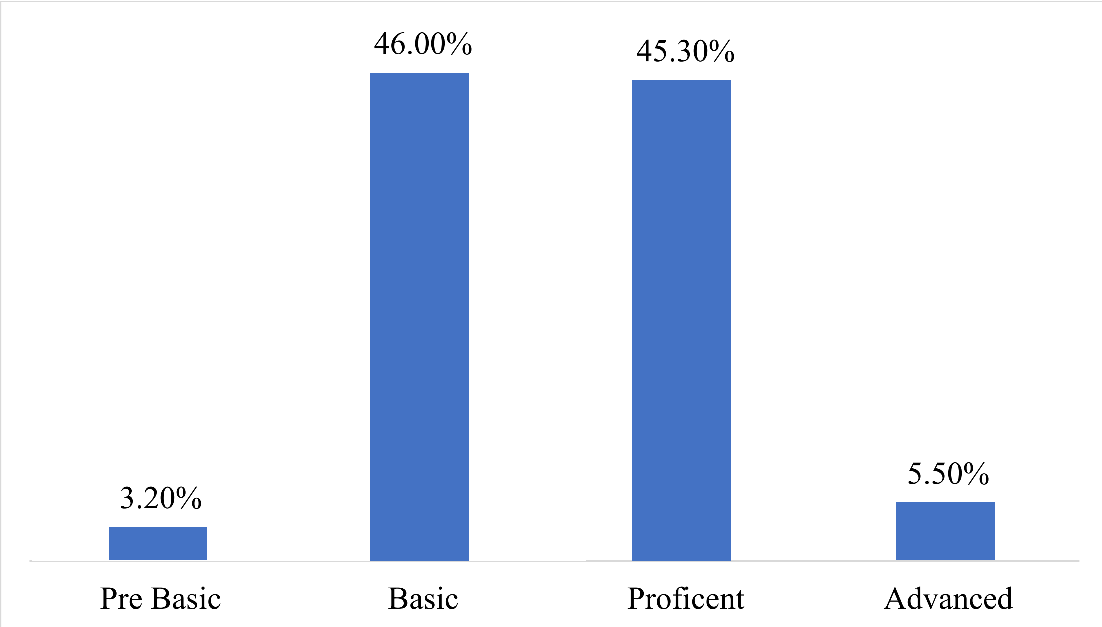

Figure 34 Proficiency level of the students in Nepali at the national level

Achievement score in Nepali by Province

Figure 35 illustrates the mean achievement scores of NASA fifth graders in the Nepali subject across seven provinces of Nepal. Bagmati province stood out with the highest achievement score of 508.66, closely followed by Gandaki with a score of 505.35, and Koshi with 501.78. These three provinces demonstrated relatively high performance in Nepali compared to the others. In the mid-range, Lumbini scored 499.18, indicating a moderate level of achievement among its students. Conversely, the achievement scores in Nepali for students from Madhesh, Karnali, and Sudurpashchim provinces were found to be below the national average. These diverse scores highlighted the significant regional disparities in educational outcomes, particularly in the Nepali subject for fifth graders. The results of ANOVA and post-hoc analyses indicated that the differences in achievement scores were statistically significant both within and between the provinces. This underscored the need for targeted interventions to address these disparities and promote equitable educational opportunities across all regions.

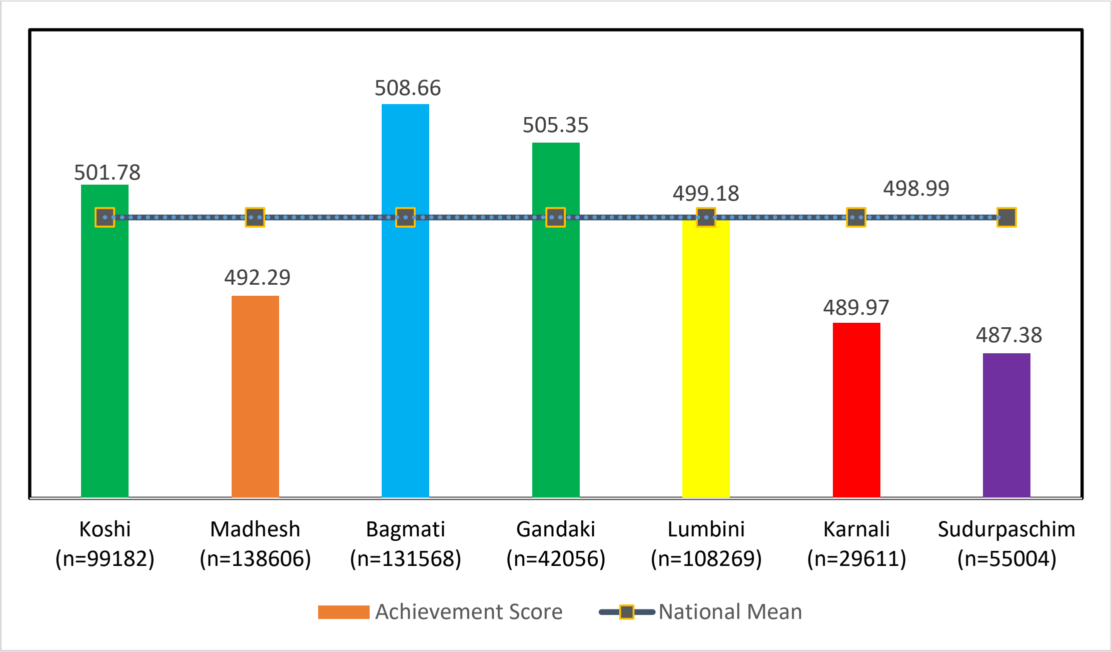

Figure 35 Achievement score in Nepali by province

Proficiency level of student in Nepali by province

Figure 36 provides a detailed overview of the proficiency levels of fifth-grade students across different provinces of Nepal, shedding light on educational outcomes and areas needing improvement. In Koshi province, 2.90% of fifth-grade students were categorized as pre-basic, indicating they possessed minimal foundational skills and might require additional support to reach grade-level standards in Nepali subject. A substantial portion, 42.50%, fell into the basic proficiency level, suggesting these students had a fundamental understanding of the material but still needed further development. Nearly half of the students in Koshi province, 48.40%, were classified as proficient in Nepali subject, demonstrating a satisfactory mastery of grade-level content. Additionally, a smaller yet notable proportion, 6.20%, was designated as advanced, reflecting an exceptional understanding and mastery of Nepali subject. These insights highlighted the diverse range of student abilities within the province and underscored the importance of targeted educational strategies to support students at all proficiency levels in Nepali subject.

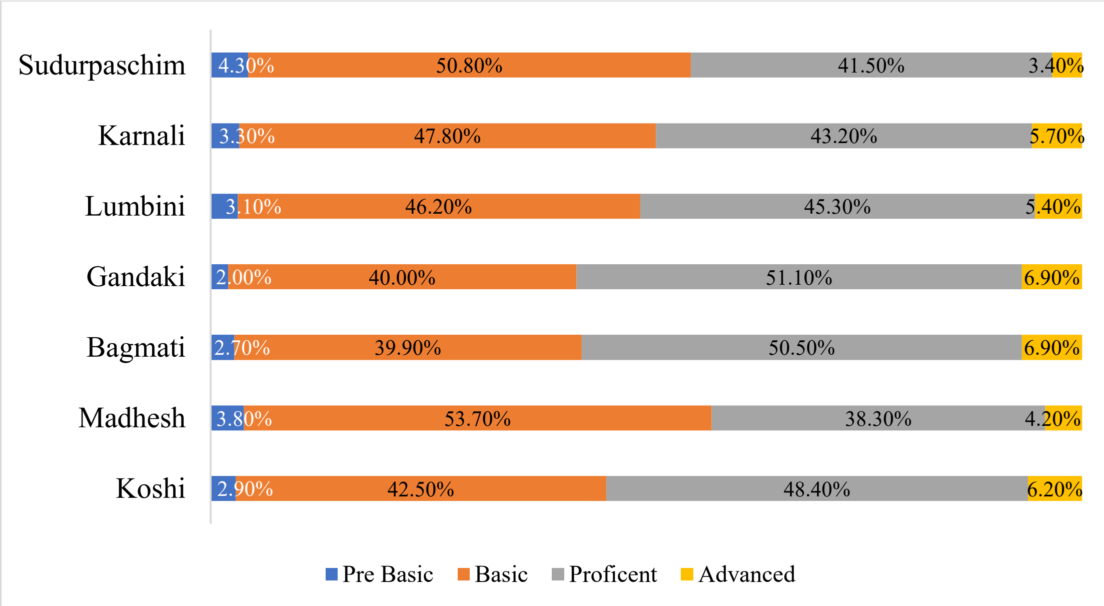

Figure 36 Proficiency level of student in Nepali by province

In the Madhesh province, a slightly higher percentage of students (3.80%) fell into the pre-basic category compared to other provinces, indicating a need for foundational skill development in Nepali subject in Madhesh provice. The majority of students (53.70%) were at the basic proficiency level, suggesting they had a fundamental understanding of the material but required further support to reach higher proficiency levels. However, the proportion of proficient students (38.30%) was lower in Madhesh compared to Koshi province, highlighting a gap in achieving satisfactory mastery of grade-level content in Nepali subject.

In comparison to other provinces in the Bagmati and Gandaki regions, a larger percentage of students were classified as proficient (50.50% and 51.10%, respectively), indicating relatively stronger academic performance compared to other regions. This result suggested that educational strategies in these regions might be more effective in helping students achieve proficiency in Nepali subject. Additionally, a notable proportion of students across all provinces demonstrated advanced proficiency levels, ranging from 3.40% in Sudurpashchim to 6.90% in Bagmati, reflecting exceptional understanding and mastery of the subjects assessed. These variations underscored the importance of tailored educational interventions to address the specific needs of students in different provincial regions in Nepali subject.

Nepali achievement scores by local governance units, types of school, gender, and family types

Table 34 presents the achievement scores of students in Nepali, categorized by local governance units, types of school, and gender, based on an independent sample t-test. The data revealed that students from Rural Municipalities had a significantly lower mean achievement score

(Mean = 487.95, SD = 46.82) compared to those from Urban Municipalities (Mean = 504.45, SD = 46.75), and the difference was statistically significant ($p < 0.01$). Similarly, students attending institutional schools showed a significantly higher mean achievement score (Mean = 522.86, SD = 40.45) than their counterparts in community schools (Mean = 485.18, SD = 45.63) in Nepali subject.

Likewise, the analysis indicated a significant difference in achievement scores in Nepali subject with respect to gender, favouring female students (Girls: Mean = 502.80, SD = 47.53; Boys: Mean = 495.89, SD = 46.70). Furthermore, students from nuclear families exhibited significantly higher achievement scores (Mean = 502.55, SD = 48.23) compared to those from joint families (Mean =500.27, SD = 45.85), and the difference was statistically significant ($p < 0.01$). These findings highlighted the disparities in educational outcomes in Nepali subject based on locality, type of school, gender, and family structure, suggesting the need for targeted interventions to address these gaps and promote equitable educational opportunities for all students.

Table 34 Nepali achievement score by local governance units, types of school, gender, and family types

Variables	N	Mean	SD	SE	P-value
Local level (n= 604296)					
Rural Municipality	199735	487.95	46.82	0.10	0.00
Urban Municipality	404561	504.45	46.75	0.07	
Types of School (n= 604296)					
Institutional School	221576	522.86	40.45	0.09	0.00
Community School	382720	485.18	45.63	0.07	
Gender (n= 597912)					
Boys	296532	495.89	46.70	0.09	0.00
Girls	301380	502.80	47.53	0.09	
Family Types (n=553657)					
Nuclear Family	233798	502.55	48.23	0.10	0.00
Joint Family	319859	500.27	45.85	0.08	

Proficiency levels in Nepali by local governance

Figure 37 highlights the proficiency levels of fifth-grade students in both urban municipalities and rural municipalities in Nepal, revealing a notable disparity in educational achievement in Nepali subject. The data compared the performance of students across different categories of proficiency in Nepali.

In the “pre-basic” category, Rural Municipalities had a slightly higher percentage of students (4.10%) compared to Urban Municipalities (2.80%). This trend continued in the “Basic” level, where Rural Municipalities led with 54.10%, while Urban Municipalities had 42.00%. However, the trend shifted at the higher proficiency levels. In the “Proficient” category, Urban Municipalities outperformed Rural Municipalities, with 48.90% of students reaching this level compared to 38.00% in rural areas. The gap widened further in the “Advanced” category, where Urban Municipalities had 6.40% of students achieving this level, compared to just 3.80% in Rural Municipalities.

This result indicated that while rural areas had a larger proportion of students at the basic proficiency levels, Urban Municipalities had a higher proportion of students achieving proficient and advanced levels. This difference suggested a significant disparity in educational outcomes between urban and rural areas, with urban students more likely to reach higher levels of academic achievement in Nepali subject.

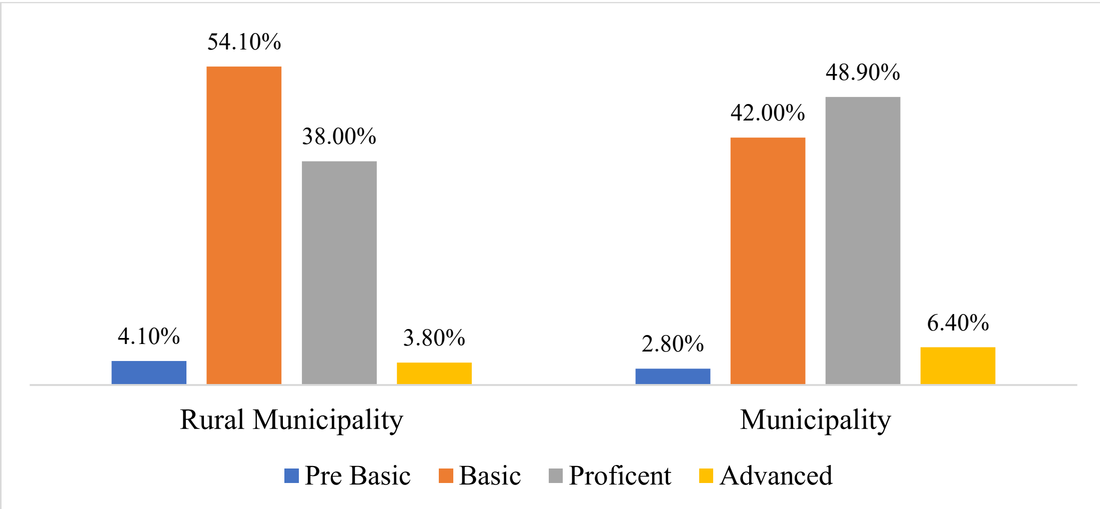

Figure 37 Proficiency level of students in Nepali by local level

Proficiency levels in Nepali by school types

Figure 38 illustrates the proficiency levels of students in community and institutional schools, highlighting significant differences in educational outcomes in Nepali subject. In the “Pre-basic” category, community schools had a higher percentage of students (4.60%) compared to institutional schools (0.80%). This trend continued at the “Basic” level, where community schools lead significantly with 56.10%, while institutional schools have 28.50%.

However, the trend reversed at higher proficiency levels. At the “Proficient” level, institutional schools showed a markedly higher percentage of students (60.50%) compared to community schools (36.50%). This disparity became even more pronounced in the “Advanced” category, where institutional schools had 10.20% of students achieving this level, compared to just 2.80% in community schools.

These results suggested that while community schools had a larger proportion of students at the basic proficiency levels, institutional schools excelled in producing students who achieved proficient and advanced levels in Nepali subject. This indicated a significant disparity in educational outcomes in Nepali, with institutional schools more successful in fostering higher academic achievement.

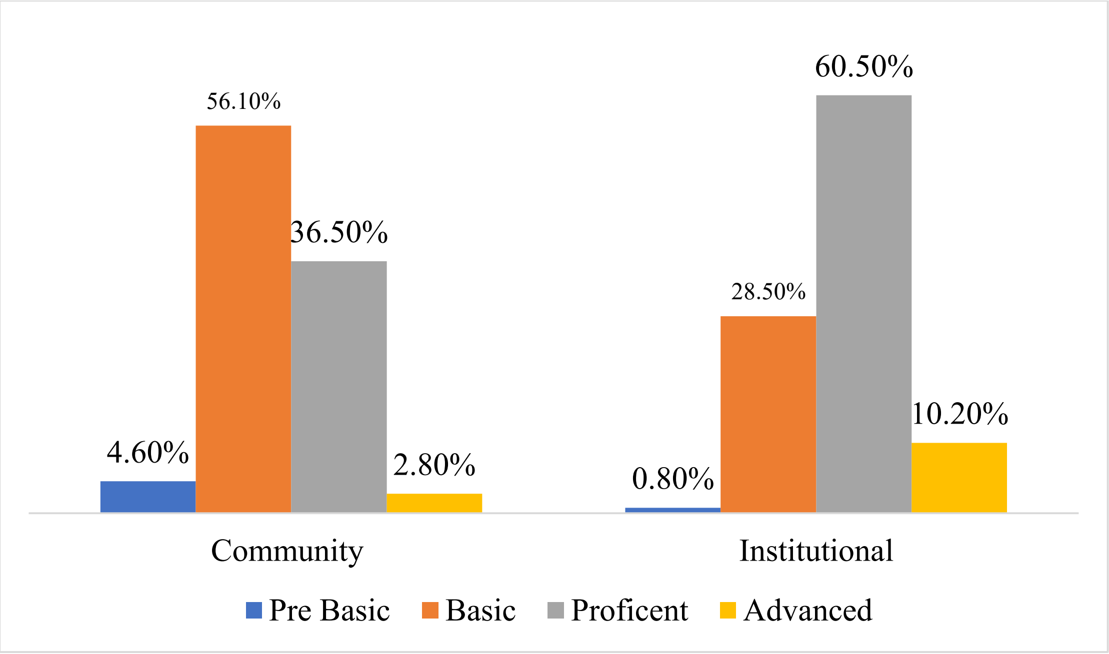

Figure 38 Proficiency level of students in Nepali by school types

Proficiency levels in Nepali by gender

Figure 39 provides a detailed comparison of proficiency levels in the Nepali subject between boys and girls, revealing notable differences in their academic performance. In the "Pre-basic" category, boys had a higher percentage of students (4.10%) compared to girls (2.00%). This trend continued at the "Basic" level, where boys led with 51.10%, while girls had 40.70%.

However, the trend shifted at higher proficiency levels. In the "Proficient" category, girls outperformed boys, with 50.00% of girls reaching this level compared to 41.00% of boys. The disparity became even more pronounced in the "Advanced" category, where 7.20% of girls achieved this level, compared to only 3.90% of boys.

The results data indicated that while boys had a higher proportion of students at the basic proficiency levels, girls excelled at the proficient and advanced levels in the Nepali subject. This also suggested that girls were more successful in achieving higher academic performance in this subject area than boys.

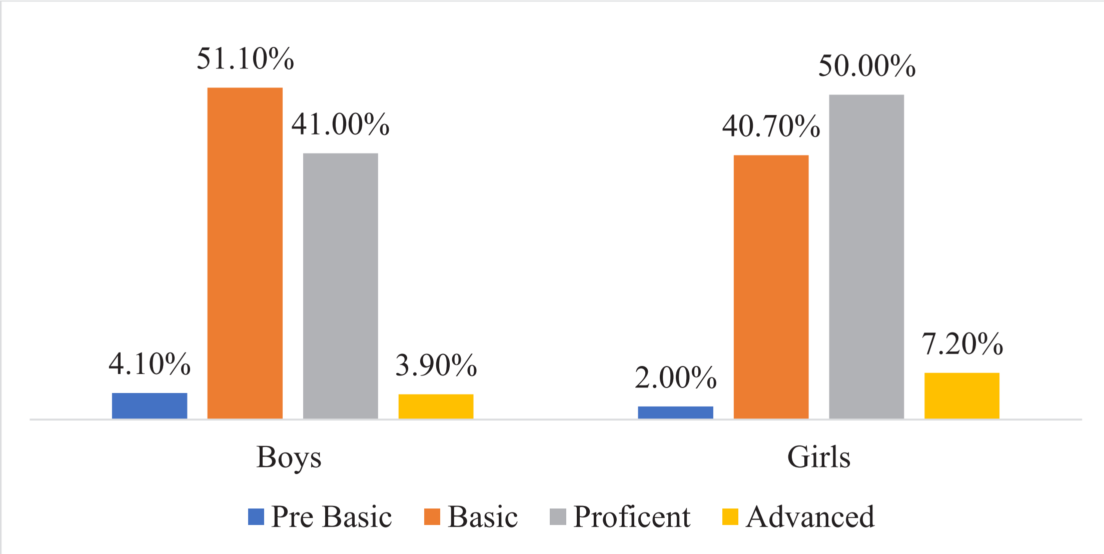

Figure 39 Proficiency level of students in Nepali by gender

Achievement scores in Nepali by home language

Figure 40 presents the average achievement scores of students in the Nepali subject, categorized by the language spoken at home. The data revealed a notable difference in performance based on this factor. Specifically, students who spoke Nepali at home had a significantly higher average achievement score, with a mean of 507.41. In contrast, students who spoke other languages at home had a lower average score, with a mean of 490.57. This difference suggested that the home language environment played a crucial role in students' academic success in the Nepali subject.

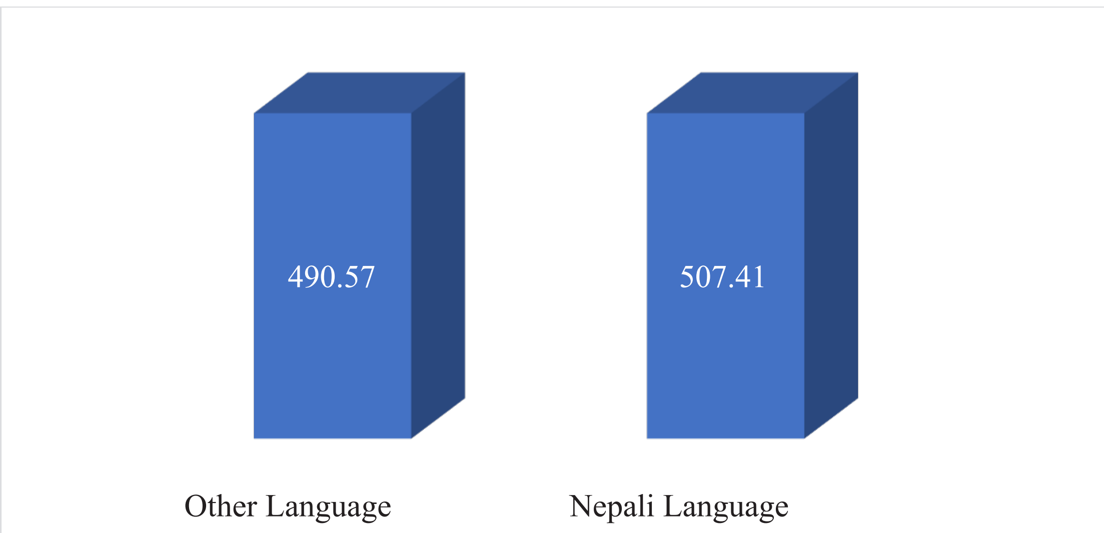

Figure 40 Achievement score in Nepali by home language

Nepali achievement scores by ethnicity, geography, support to study, and distance of school

Table 35 provides a detailed analysis of the achievement scores in Nepali subject, using ANOVA test to examine the impact of ethnicity, geography, study support, and school distance. The results indicated significant differences between these factors.

Ethnicity: Brahmin/Chettri students had the highest average score (Mean = 507.5, SD = 46.15), followed by Janjati students (Mean = 499.87, SD = 46.67) in Nepali subject. Dalit students had the lowest average score (Mean = 490.64, SD = 47.66). Post-hoc analysis confirmed that the differences in achievement scores in Nepali subject among all ethnic groups are statistically significant ($p < 0.01$).

Geography: Students from the Mountain region had the highest average score (Mean = 503.96, SD = 46.13), followed by those from the Himali region (Mean = 502.22, SD = 45.06). Terai (Madhesi) students had the lowest average score (Mean = 498.04, SD = 47.73). This result suggested that geographical location significantly influenced academic performance, with mountain students performing the best.

Study Support: Table 35 shows that students receiving support from their father (Mean = 496.78, SD = 47.08) and friends (Mean = 490.94, SD = 42.78) had lower achievement scores. In contrast, students receiving tuition support (Mean = 512.49, SD = 43.68) and those without any support (Mean = 514.67, SD = 46.96) had higher scores. Post-hoc analysis indicated significant differences in achievement scores across all categories of study support in Nepali subject ($p < 0.01$).

School Distance: The time taken to reach school also affected achievement scores in Nepali. Students living within 15 minutes (Mean = 503.21, SD = 46.14) and 30 minutes (Mean = 503.17, SD = 46.01) of their schools had higher scores. Those with a commute of 1-2 hours (Mean = 482.54, SD = 50.18) and more than 2 hours (Mean = 481.18, SD = 45.97) had significantly lower scores. Post-hoc analysis showed that the differences were significant between these groups ($p < 0.01$), except between the 15-minute and 30-minute groups, and the 1-2 hour and more than 2-hour groups.

Overall, the data highlighted the significant impact of ethnicity, geography, study support, and school distance on students' achievement scores in Nepali subject. These findings underscored the importance of considering these factors in educational planning and policymaking for Nepali subject teaching-learning at elementary school level in Nepal.

Table 35 Nepali achievement score by ethnicity, geography, support to study, and distance of school.

Variables with categories	N	Mean	SD	SE	p-value
Ethnicity (n=525536)					
Brahmin/Chhetri	196869	507.50	46.15	0.10	0.00
Janajati	202718	499.87	46.67	0.10	
Dalit	56381	490.64	47.66	0.20	
Other Ethnicity	69568	497.87	46.39	0.18	
Geography (n=525536)					
Madheshi (Terai)	216335	498.04	47.73	0.10	0.00
Pahadi (Mountain)	295319	503.96	46.13	0.08	
Himali	13883	502.22	45.06	0.38	
Support to Study (n=543603)					
Father	150471	496.78	47.08	0.12	0.00
Mother	115017	502.38	47.93	0.14	
Sibling	208679	504.63	43.58	0.10	
Tuition	36078	512.49	43.68	0.23	
Friends	21007	490.94	42.78	0.30	
None	12351	514.67	46.96	0.42	
Time to Reach School (n=568519)					
Up to 15 min	350776	503.21	46.14	0.08	0.00
30 min	129401	503.17	46.01	0.13	
1 hour	57907	497.46	44.87	0.19	
1-2 hours	19774	482.54	50.18	0.36	
More than 2 hours	10662	481.18	45.97	0.45	

Proficiency level of students in Nepali by ethnicity

Figure 41 illustrates the proficiency levels in the Nepali subject across various ethnic groups, revealing significant disparities.

Pre-basic Level: Dalit students had the highest percentage in this category, with 3.60%, followed by Janajati students at 3.20%, Others at 3.10%, and Brahmin/Chettri students at 2.20%. This result indicated that a larger proportion of Dalit students were struggling at the most fundamental level compared to other groups in Nepali language.

Basic Level: At this level, Dalit students again led with 52.50%, indicating that more than half of the Dalit students were only achieving basic proficiency. They were followed by students categorized as Others at 49.60%, Janajati students at 45.80%, and Brahmin/Chettri students at 38.50%. This result also suggested that a significant number of students from Dalit and Other ethnic groups were concentrated at the basic proficiency level.

Proficient Level: The trend shifted at the proficient level, where Brahmin/Chettri students had the highest percentage at 51.00%. They were followed by Janajati students at 45.90%, Others at 43.30%, and Dalit students at 39.20%. This result indicated that Brahmin/Chettri students were more likely to achieve proficiency in the Nepali subject compared to other ethnic groups.

Advanced Level: The pattern of ethnic disparity in student achievement continued in the advanced category, with Brahmin/Chettri students leading at 8.20%, followed by Janajati students at 5.00%, Dalit students at 4.70%, and Others at 4.00% in Nepali subject. This result showed that Brahmin/Chettri students were more likely to reach the highest levels of proficiency.

Overall, the data suggested that while Dalit and Other ethnic groups had higher proportions of students at the basic level, Brahmin/Chettri students excelled at proficient and advanced levels. This outcome highlighted a significant disparity in academic achievement across different ethnic groups, with Brahmin/Chettri students generally performing better in Nepali subject.

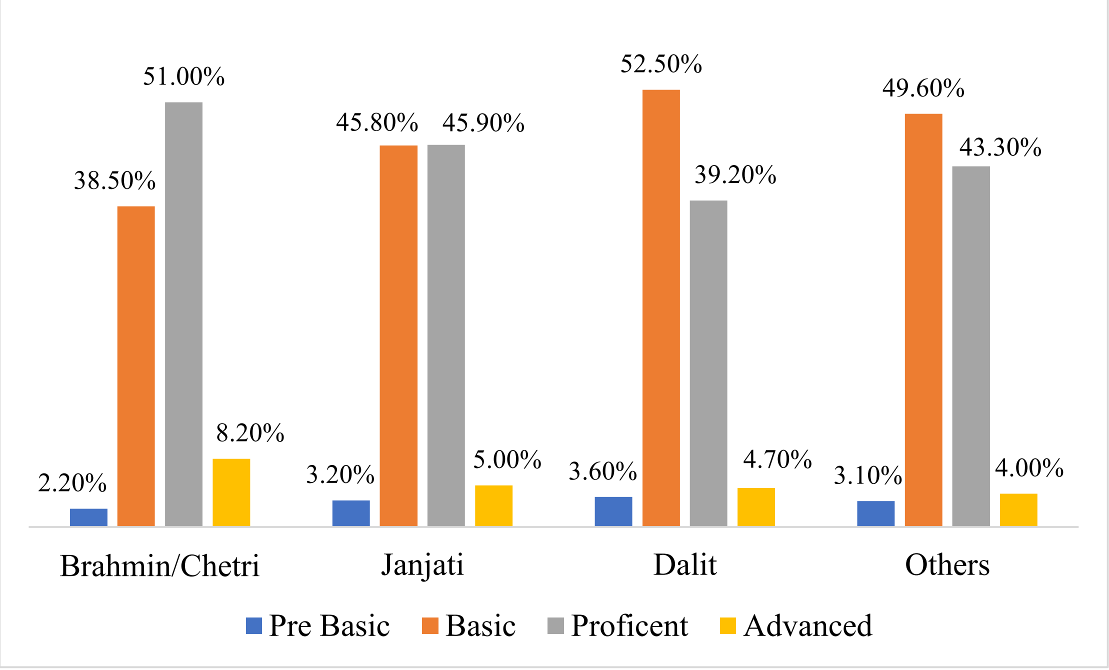

Figure 41 Proficiency level of students in Nepali by ethnicity

Proficiency level of students in Nepali subject by geography

Figure 42 provides a detailed breakdown of the proficiency levels in the Nepali subject among students from different geographical regions.

Pre-Basic Level: Madhesi students had the highest percentage in this category, with 3.20%, indicating that a larger proportion of Terai (Madhesi) students were struggling at the most fundamental level. They were followed by Mountain (Pahadi) students at 2.60% and Himali students at 1.70%.

Basic Level: At this level, Terai (Madhesi) students continued to lead with 49.10%, suggesting that nearly half of the Terai students were only achieving basic proficiency. Himali students followed with 43.80%, and Moutain (Pahadi) students with 40.90%. This result indicated that a significant number of students from these regions were concentrated at the basic proficiency level.

Proficient Level: The trend shifted at the proficient level, where Mountain (Pahadi) students had the highest percentage at 49.80%, closely followed by Himali students at 50.40%. Terai (Madhesi) students had a lower percentage at 42.40%. This result suggested that Mountain (Pahadi) and Himali students were more likely to achieve proficiency in the Nepali subject compared to Terai (Madhesi) students.

Advanced Level: In the advanced category, Mountain (Pahadi) students led with 6.70%, followed by Terai (Madhesi) students at 5.20% and Himali students at 4.20%. This outcome indicated that Mountain (Pahadi) students were more likely to reach the highest levels of proficiency in Nepali.

Overall, the data highlighted that while Terai (Madhesi) students had higher proportions at the pre-basic and basic levels, Mountai (Pahadi) and Himali students excelled at the proficient and advanced levels. This result suggested a disparity in academic achievement across different geographical regions, with Mountain (Pahadi) and Himali students generally performing better in the Nepali subject.

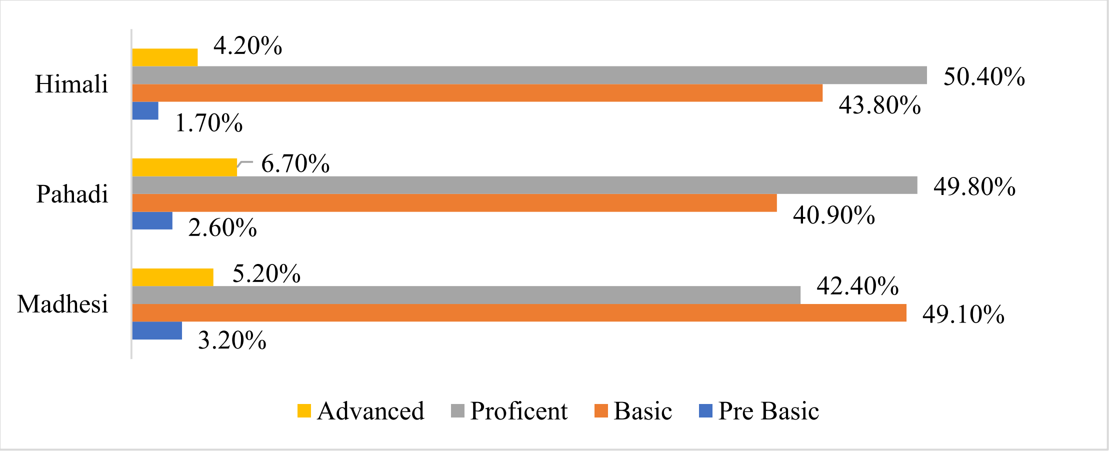

Figure 42 Proficiency level of students in Nepali subject by geography

Achievement of students in Nepali by parents' education

Table 36 provides a comprehensive analysis of the average achievement scores in the Nepali subject, categorized by the educational levels of students' mothers and fathers. The data revealed a clear positive correlation between parental education and students' academic performance.

Illiterate Parents: Students whose mothers and fathers were illiterate had the lowest average achievement scores, with mean score 489.37 (SD = 45.00) for illiterate mother and 483.66 (SD = 44.61) for illiterate father. This suggests that the lack of formal education among parents might negatively impact their children's academic performance.

Literate Parents: Students with parents who had basic literacy skills showed an improvement in average scores (Mother: Mean = 498.52, SD = 44.86; Father: Mean = 494.65, SD = 44.66), but these scores were still below the national average. This also indicated that while basic literacy in parents provided some benefit, it was not sufficient to reach or exceed national performance standards.

Higher Education: The most significant improvement was seen in students whose parents had education levels higher than school education. These students had the highest average achievement scores (Mother: Mean = 527.76, SD = 46.94; Father: Mean = 527.94, SD = 46.13) in the Nepali subject when their parents had Master's or above qualification. This outcome underscored the importance of parents' higher education in fostering better academic outcomes for their children in Nepali subject.

Post-Hoc Analysis: The post-hoc analysis further confirmed that the differences in achievement scores were significant across all categories of parental education levels ($p < 0.01$). This meant that each step up in parents' education level corresponded to a statistically significant increase in students' achievement scores in Nepali.

Overall, the results from Table 36 highlighted the crucial role of parental education in students' academic success. The data suggested that efforts to improve parental education could have a positive impact on students' performance in the Nepali subject.

Table 36 Achievement of students in Nepali by parent education

Categories	Mother Education (n=568072)				Fathers' Education (n=556789)			
	N	Mean	SD	SE	N	Mean	SD	SE
Illiterate	133610	489.37	45.00	0.12	76628	483.66	44.61	0.16
Literate	120000	498.52	44.86	0.13	96641	494.65	44.66	0.14
Up to 10 class	158986	501.16	45.56	0.11	166409	501.71	44.28	0.11
12 class	107218	508.77	46.28	0.14	145763	504.52	45.94	0.12
Bachelors	26550	522.67	45.84	0.28	38474	521.76	43.53	0.22

Categories	Mother Education (n=568072)				Fathers' Education (n=556789)			
	N	Mean	SD	SE	N	Mean	SD	SE
Masters or Above	21707	527.76	46.94	0.32	32874	527.94	46.13	0.25
p-value	0.00				0.00			

Proficiency of students in Nepali by mother education

Figure 43 illustrates the distribution of students across different proficiency levels in the Nepali subject, categorized by their mothers' educational backgrounds.

Illiterate Mothers: Among students whose mothers were illiterate, 3.40% fell into the pre-basic category, indicating the lowest level of proficiency. A significant number with 54.70% were in the Basic category, showing that more than half of these students achieved only basic proficiency. Meanwhile, 38.90% were in the Proficient category, and only a small number with 3.00% reached the Advanced level.

Literate Mothers: For students with literate mothers, the distribution showed some improvement. In this group, 3.10% were in the pre-basic category, 48.00% in the Basic category, 44.80% in the Proficient category, and 4.00% in the Advanced category. This result indicated a slight shift towards higher proficiency levels compared to students with illiterate mothers.

Higher Education of Mothers: As the educational level of mothers increased, the distribution of students across proficiency levels followed a noticeable pattern. Students whose mothers had completed 10th grade, 12th grade, bachelor's, or master's degrees tended to have lower percentages in the Pre-basic and Basic categories and higher percentages in the Proficient and Advanced categories. This trend highlighted the positive impact of higher maternal education on students' academic performance in Nepali subject.

Overall, the data from Figure 43 underscored the significant influence of mothers' education on students' proficiency levels in the Nepali subject. Higher education of mothers was associated with better academic outcomes, suggesting that efforts to improve maternal education could positively affect students' performance.

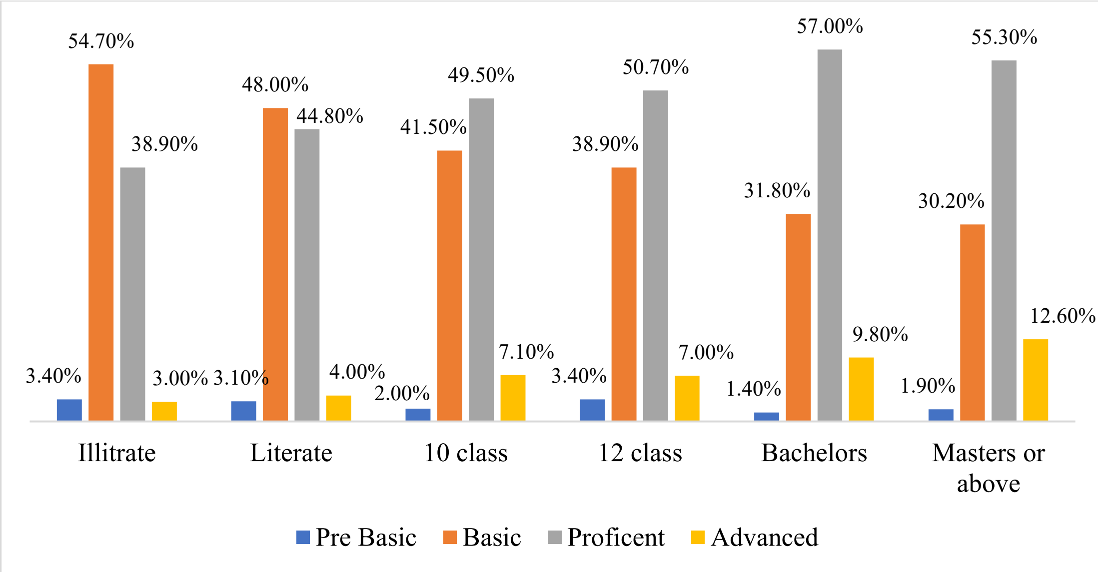

Figure 43 Proficiency of students in Nepali by mother education

Proficiency of students in Nepali by father education

Figure 44 illustrates the distribution of students across various proficiency levels in the Nepali subject, categorized by their fathers' educational backgrounds.

Illiterate Fathers: Among students whose fathers were illiterate, 4.80% fell into the pre-basic category, indicating the lowest level of proficiency. A significant number with 59.80% were in the Basic category, showing that the majority of these students achieved only basic proficiency. Meanwhile, 33.80% of students were in the Proficient category, and a small number with 1.50% of students reached the Advanced level. This distribution suggested that students with illiterate fathers were more likely to struggle academically.

Literate Fathers: For students with literate fathers, the distribution showed some improvement. In this group, 3.30% of students were in the pre-basic category, 52.30% in the Basic category, 40.90% in the Proficient category, and 3.40% in the Advanced category. This result indicated a shift towards higher proficiency levels compared to students with illiterate fathers.

Higher Education of Fathers: As the educational level of fathers increased, the distribution of students across proficiency levels followed a noticeable pattern. Students whose fathers had completed 10th grade, 12th grade, bachelor's, or master's degrees tended to have lower percentages in the Pre-basic and Basic categories and higher percentages in the Proficient and Advanced categories. This trend highlighted the positive impact of fathers' higher education on students' academic performance.

Overall, the data from Figure 44 underscored the significant influence of fathers' education on students' proficiency levels in the Nepali subject. Higher education of fathers was associated with better academic outcomes, suggesting that efforts to improve fathers' education could positively affect students' performance.

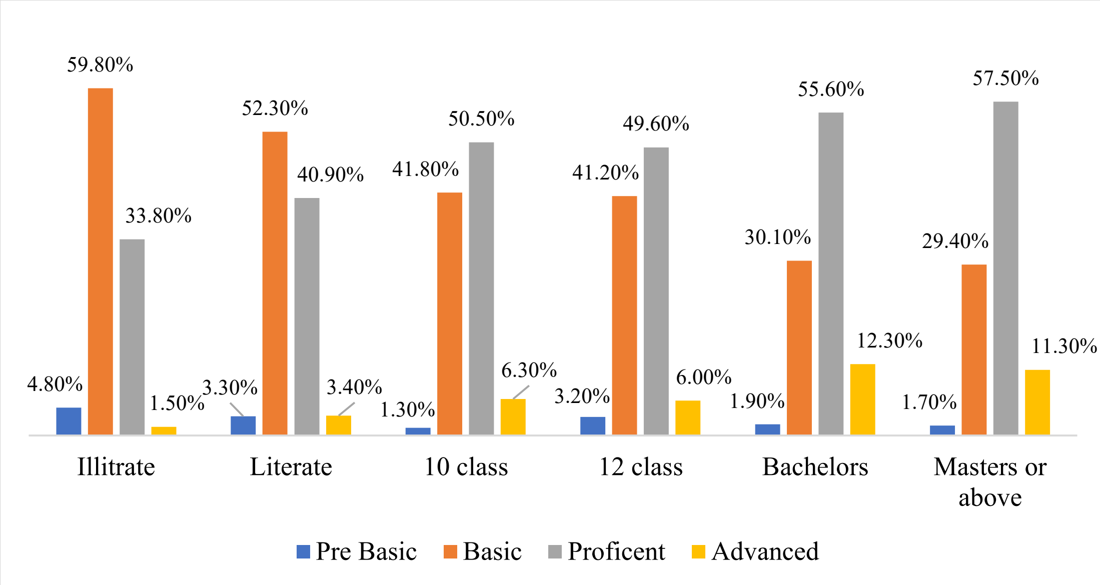

Figure 44 Proficiency of students in Nepali by father education

Performance of Students in Nepali by parent occupation

Table 37 provides a detailed analysis of students' average scores in the Nepali subject, categorized by their parents' occupations. The occupations ranged from farming and housework to teaching, business, and other unspecified jobs. The data revealed interesting patterns in academic performance based on parental occupation.

Father's Occupation: Students whose fathers were engaged in job had the highest achievement in Nepali (Mean = 518.10, SD = 44.90), that was followed by other professions (Mean = 517.33, SD = 41.44). Then the students whose fathers had teaching (Mean = 515.21; SD = 47.61) and business (Mean = 515.46, SD = 42.91) had higher average scores compared to those whose fathers worked in farming (Mean = 488.05, SD = 44.83), housework (Mean = 477.60; SD = 48.19), other's house (Mean = 477.66, SD = 40.03), or labour (Mean = 503.55, SD = 47.41) (Table 37). These results suggested that occupations requiring higher levels of education, such as teaching and business, were associated with better academic outcomes for students in Nepali subject. The ANOVA results indicated significant differences in achievement scores based on fathers' occupations ($p < 0.01$). However, post-hoc analysis showed that the differences between student achievement whose fathers had jobs and other unspecified jobs, as well as between teaching and business professions, were not statistically significant.

Mother's Occupation: The analysis of mothers' occupations showed a similar trend as fathers' occupation on student achievement in Nepali subject. Students whose mothers were involved in teaching (Mean = 525.68, SD = 42.76), professional jobs (Mean = 519.98, SD = 45.97), or other unspecified jobs (Mean = 519.02, SD = 44.76) had significantly higher average scores than students whose mothers were engaged in farming (Mean = 495.53, SD = 45.35), housework (Mean = 504.06, SD = 46.44), work in others house (Mean = 493.68, SD = 43.95), or labour work (Mean= 496.63, SD = 48.35) (Table 37). These results highlighted the positive impact of higher educational and professional levels of mothers on students' academic performance. The ANOVA results confirmed significant differences in achievement scores based on mothers' occupations ($p < 0.01$). Post-hoc analysis further showed that these differences were significant in all cases except between farming and housework, and labour work, as well as between professional jobs and other unspecified jobs.

Overall, the data from Table 37 underscored the influence of parental occupation on students' academic outcomes in Nepali subject. Higher educational and professional levels of parents, particularly in teaching and business, were associated with better performance of students in the Nepali subject. This result suggested that parents' education and occupation might play a crucial role in shaping students' academic success.

Table 37 Achievement of Students in Nepali by Parent Occupation

Occupation categories	Fathers' occupation (n=560646)			Mothers' occupation (n=568381)		
	N	Mean	SD	N	Mean	SD
Farming and Housework	160572	488.05	44.83	287520	495.53	45.35
Housework Only	21246	477.60	48.19	166867	504.06	46.44
Work in others House	9273	477.66	40.03	7099	493.68	43.95
Labor Work	41802	503.55	47.41	11174	496.63	48.35
Foreign Work	137072	502.38	44.99	11187	500.25	43.78
Teaching	21434	515.21	47.61	19557	525.68	42.76
Business	81635	515.46	42.91	34837	515.70	41.33
Job	43403	518.10	44.90	15388	519.97	45.97
Others	44209	517.33	41.44	14753	519.02	44.76
p-value	0.00			0.00		

Nepali achievement score based on out of school time

Table 38 provides a detailed analysis of students' achievement scores in the Nepali subject, based on their activities outside of school. The results, derived from ANOVA, highlighted the impact of various extracurricular activities on academic performance.

Use of TV/Internet/Mobile: Students who spent one to two hours daily on TV, internet, or mobile devices had significantly higher achievement scores (Mean = 508.06). However, those who used these devices for more than two hours showed a notable decline in their scores in Nepali subject (Mean = 484.93) (Table 38).

Playing with Friends: Similarly, students who played out with friends for one to two hours daily achieved higher scores (Mean = 506.58) in Nepali than the students who played longer hours (Mean = 486.41) or did not play (Mean = 495.84) (Table 38).

Household Chores: Engaging in household chores for one to two hours daily was associated with higher achievement scores (Mean = 508.71). Students who did not participate in household chores at all tended to have lower scores (Mean = 486.47) (Table 38).

Supporting Siblings: Students who spent one to four hours supporting their siblings had better achievement scores (Mean = 510.48) compared to those who do not spend any time (Mean = 499.80) or spend more than four hours on this activity (Mean = 485.34) (Table 38).

Work for Wages: Students who did not engage in wage-earning activities had significantly higher achievement scores (Mean = 510.69) compared to those who did (Mean = 484.86 to 491.41) (Table 38).

Study/Homework: The most significant improvement in achievement scores was seen among students who dedicated more than two hours daily to study or homework (Mean = 517.37). These students outperformed those who spend less than one hour (Mean 491.39) or no time at all on their studies outside of school (Mean = 475.64) (Table 38).

Post-Hoc Analysis: The post-hoc analysis confirmed that the differences in achievement scores were significant across all categories of the measured activities ($p < 0.01$). This meant that each activity level had a statistically significant impact on students' academic performance.

Overall, the data from Table 38 underscored the importance of balanced extracurricular activities. Moderate use of TV/internet/mobile, playing with friends, and engaging in household chores, along with dedicated study time, positively influenced students' achievement scores in the Nepali subject. Conversely, excessive use of devices, prolonged playtime, and lack of engagement in household chores or study time negatively impacted academic performance in Nepali subject.

Table 38 Nepali achievement score based on spending time out of school

Activities	Mean achievement score				
	Time not Given	< one hour	1-2 hours	2-4 hours	>4 hours
Use of Digital Resources	493.33	505.79	508.06	500.84	484.53
Play With Fiends	495.84	504.16	506.58	496.34	486.41
Household Chores	486.47	504.01	508.71	500.56	491.53
Study/Homework	475.64	491.39	509.68	517.37	505.89
Work for Wages	510.69	484.86	483.05	491.41	490.24
Support to Siblings	499.80	503.08	510.48	505.46	485.34

Nepali achievement based on engagement at school

Table 39 provides a comprehensive analysis of how different aspects of school engagement impacted students' achievement scores in the Nepali subject. The study considered three main factors: leisure time activities at school, the frequency of extracurricular activities (ECA), and student participation in ECA.

Leisure Time Activities: Students' leisure time activities at school were categorized into four groups: classwork/homework, group work, playing, and no leisure time. The results showed that students who spend their leisure time on classwork/homework (Mean = 503.42, SD = 45.51) or have no leisure time at all (Mean = 514.50, SD = 45.75) achieved significantly higher scores compared to those who engage in group work (Mean = 492.01, SD = 45.88) or playing during their leisure time (Mean = 484.64, SD = 43.50) (Table 39).

Frequency of ECA Activities: The frequency of ECA activities at schools was measured on a three-point scale: never, sometimes, and regular. The findings indicated that students from schools that conducted ECA activities sometimes have better achievement scores (Mean = 505.48, SD = 46.18) compared to those from schools that conduct these activities regularly (Mean = 496.35, SD = 46.81) or never (Mean = 470.78, SD = 42.73) (Table 39).

Participation in ECA: Similarly, student participation in ECA was also measured on a three-point scale: never, sometimes, and regular. Students who participate in ECA sometimes (Mean = 504.04, SD = 45.40) show significantly better achievement scores compared to those who participate regularly (Mean = 500.09, SD = 48.11) or never (Mean = 487.52, SD = 44.82) (Table 39).

Post-Hoc Analysis: The post-hoc analysis confirms that the differences in mean scores are significant across all categories of the three measured variables ($p < 0.01$): leisure time activities at school, frequency of ECA activities, and student participation in ECA.

Overall, the results suggested that engagement in classwork/homework and moderate participation in extracurricular activities positively influenced students' academic performance in the Nepali subject. Conversely, excessive or insufficient engagement in these activities might not be as beneficial.

Table 39 Nepali achievement based on engagement at school

Activities in School		N	Mean	SD	SE	p-value
Leisure Time Activity at School (n= 558215)	Classwork/homework	337414	503.42	45.51	0.08	0.00
	Group work	57751	492.01	45.88	0.19	
	Playing	60536	484.64	43.50	0.18	
	Have no leisure time	102513	514.50	45.75	0.14	
ECA Activities (n=573991)	Regular	257522	496.35	46.81	0.09	0.00
	Sometimes	304974	505.48	46.18	0.08	
	Never	11495	470.78	42.73	0.40	
ECA Participation (n= 562811)	Regular	212166	500.09	48.11	0.10	0.00
	Sometimes	313588	504.04	45.40	0.08	
	Never	37057	487.52	44.82	0.23	

Average Nepali achievement score based on perception of students

Table 40 provides a detailed analysis of how students' attitudes and experiences impacted their achievement scores in the Nepali subject. The findings highlighted several key factors that significantly influenced academic performance.

Attitudes Towards Teacher, School, Subject, and Learning: Students with positive attitudes towards their teachers (Mean = 501.16, SD = 46.88), school (Mean = 501.36, SD = 46.83), subject Nepali (Mean = 500.98, SD = 46.79), and learning (Mean = 501.57, SD = 46.63) (Table 40) had significantly higher achievement scores ($p < 0.01$) compared to those with negative attitudes. This result suggested that a positive outlook and engagement with the educational environment played a crucial role in academic success in Nepali subject.

Lesson Practices: The table also shows that students who engaged in lesson practices for some lessons (Mean = 503.83, SD = 47.92) or about half of the lessons achieve significantly higher scores (Mean = 505.85, SD = 45.91) than those who never engage (Mean = 478.88, SD = 49.71) or engage in every lesson (Mean = 478.40, SD = 42.35) (Table 40). This indicated that a balanced approach to lesson practices, rather than extremes, was more beneficial for students' academic performance in the Nepali subject.

Bullying: The data revealed that students who did not face any bullying had significantly higher achievement scores (Mean = 506.44, SD = 45.10) compared to those who experienced some kinds of bullying (Mean = 496.11, SD = 47.91) (Table 40). Despite this result, a considerable number of students, such as 16.1% to 33.7% of students reported facing some forms of bullying at school (Figure 45). This underscored the negative impact of bullying on academic performance and highlighted the need for effective anti-bullying measures in schools.

Overall, the data from Table 40 emphasized the importance of fostering positive attitudes, balanced lesson practices, and a safe school environment to enhance students' academic outcomes in the Nepali subject. Addressing these factors could lead to significant improvements in student achievement.

Table 40 Mean difference based on self-reported attitude on Nepali achievement score

Variables	N	Mean	SD	p-value
Attitude Towards Teacher				
Negative	23594	467.83	42.70	0.00
Positive	568753	501.16	46.88	
Total	592346	499.83	47.18	
Attitude Towards School				
Negative	24710	472.87	44.84	0.00
Positive	562759	501.36	46.83	
Total	587469	500.16	47.10	
Attitude Towards Subject				
Negative	26405	476.61	48.01	0.00
Positive	564273	500.98	46.79	
Total	590678	499.89	47.12	
Attitude Towards Learning				
Negative	35250	481.59	49.41	0.00
Positive	548569	501.57	46.63	
Total	583818	500.36	47.05	
Attitude Towards Engagement in School				
Never	4662	478.88	49.71	
Some Lessons	136909	503.83	47.92	
About half Lesson	338584	505.85	45.91	
In every Lesson	109510	478.40	42.35	
Total	589665	500.07	47.00	0.00
Bullying Activities				

Variables	N	Mean	SD	p-value
No Bullying	227875	506.44	45.10	0.00
Bullying	358311	496.11	47.91	
Total	586186	500.12	47.11	

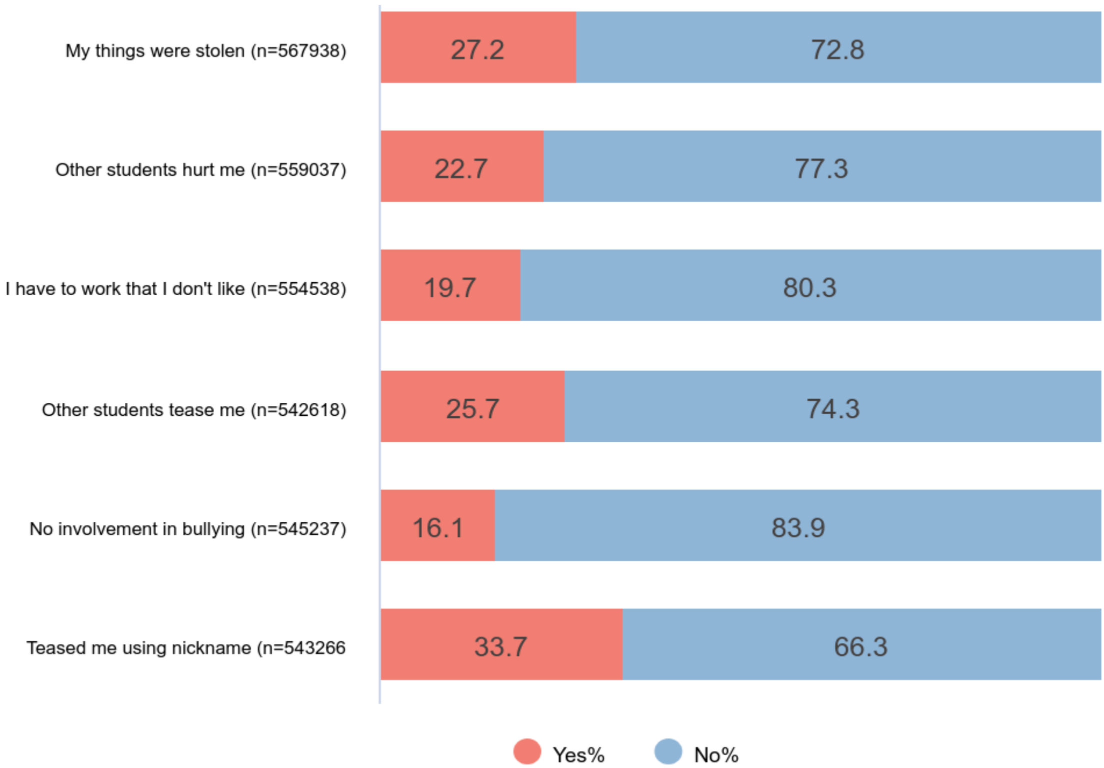

Figure 45 Percentage of students facing bullying in Nepali class

Effect of individual, family, and school related factors on Nepali achievement

This section presents an analysis of how personal, family, and school-related factors influenced students' achievement scores in the Nepali subject (Table 41). The model used in this analysis explained 14% of the variance in achievement scores, highlighting several key factors that significantly impacted students' academic performance in the Nepali subject.

Positive Factors:

Time for Study/Homework: The most influential positive factor was the amount of time students dedicated to study and homework, with a Beta value of 0.15. This indicated that increased study time was strongly associated with higher achievement scores.

Father's Education: The educational level of the father also played a significant role, with a Beta value of 0.09. Higher educational attainment of the father correlated with better academic performance in students.

Home Facilities: The availability of facilities at home, such as a quiet study space and educational resources, had a positive impact on achievement scores, with a Beta value of 0.08.

Positive Learning Attitude: Students' positive attitudes towards learning Nepali contributed to higher achievement scores, with a Beta value of 0.06. This result suggested that fostering a positive mindset towards the subject could enhance academic outcomes.

Negative Factors:

Time for Work for Wages: The working time that students have spent for wages had a negative Beta value (0.12). This indicated that working for wages significantly detracted from students' academic performance in the Nepali subject.

Bullying at School: Another significant negative factor was bullying at school, with a Beta value of -0.07. Experiencing bullying had a detrimental effect on students' achievement scores, underscoring the importance of a safe and supportive school environment.

Overall, the analysis highlighted the critical role of personal dedication to study, supportive family background, and a positive learning environment in enhancing students' academic performance in the Nepali subject. Conversely, external pressures such as the need to work for wages and the presence of bullying significantly hindered students' academic success in Nepali subject (Table 41). Addressing these factors could help improve educational outcomes for students in Nepali subject at primary grades in Nepal.

Table 41 Effect of individual, family, and school related factors on Nepali achievement

Predictors	B	SE	Beta	t	Sig.	VIF
(Constant)	461.78	0.90		514.20	0.00	
Home Language	6.14	0.16	0.06	37.68	0.00	1.07
Time for using Digital Resources	0.91	0.11	0.02	8.38	0.00	1.16
Time for Play with Friends	-0.96	0.10	-0.02	-9.74	0.00	1.12
Time for Household Chores	-0.57	0.08	-0.01	-6.73	0.00	1.13
Time for study/Homework	6.06	0.07	0.15	84.01	0.00	1.14
Time for Work for Wages	-5.42	0.08	-0.12	-66.04	0.00	1.13
Time to Reach School	-1.32	0.08	-0.03	-15.60	0.00	1.02
ECA Frequency at School	1.26	0.15	0.01	8.62	0.00	1.07
ECA Participation	-0.74	0.13	-0.01	-5.55	0.00	1.08
Mother Education	2.00	0.07	0.06	26.96	0.00	1.87
Father Education	3.05	0.07	0.09	40.80	0.00	1.80
Family Type	-1.72	0.15	-0.02	-11.53	0.00	1.02

Predictors	B	SE	Beta	t	Sig.	VIF
Home Facilities	2.51	0.06	0.08	39.61	0.00	1.33
Perception Toward Teachers	15.17	0.54	0.05	28.10	0.00	1.36
Perception Towards Schools	11.46	0.47	0.05	24.29	0.00	1.41
Perception Towards Nepali Subject	4.97	0.46	0.02	10.87	0.00	1.31
Learning Attitude Toward Nepali	10.92	0.36	0.06	30.49	0.00	1.21
Bullying at School	-6.32	0.15	-0.07	-41.40	0.00	1.05
Learning Engagement	-6.42	0.12	-0.09	-51.47	0.00	1.09

CHAPTER SEVEN

Students' Performance in English

National Mean Achievement Scores in English

Student performance in English was evaluated using two primary metrics: the "achievement score" and the "proficiency level." These metrics served as essential benchmarks for understanding and assessing students' performance in the subject.

The achievement score was a numerical value that reflected a student's performance on standardized assessments. The national average for this score was established at 500, with a standard deviation of 50. This meant that most students' scores would fall within a range of 450 to 550. Scores above 500 indicated that a student was performing better than the national average, while scores below 500 suggested that a student was performing below the national average.

The proficiency level complemented the achievement score by categorizing students into different levels of mastery in English. These levels helped educators identify areas where students excelled and where they might need additional support.

Figure 46 visually represents the distribution of achievement scores in English, showing that they followed a normal distribution pattern. This bell-shaped curve indicated that most students scored near the average, with fewer students achieving very high or very low scores.

By using these two parameters, educators can gain a comprehensive understanding of student performance, tailor instruction to meet individual needs, and track progress over time. This approach ensures that all students have the opportunity to achieve their full potential in English.

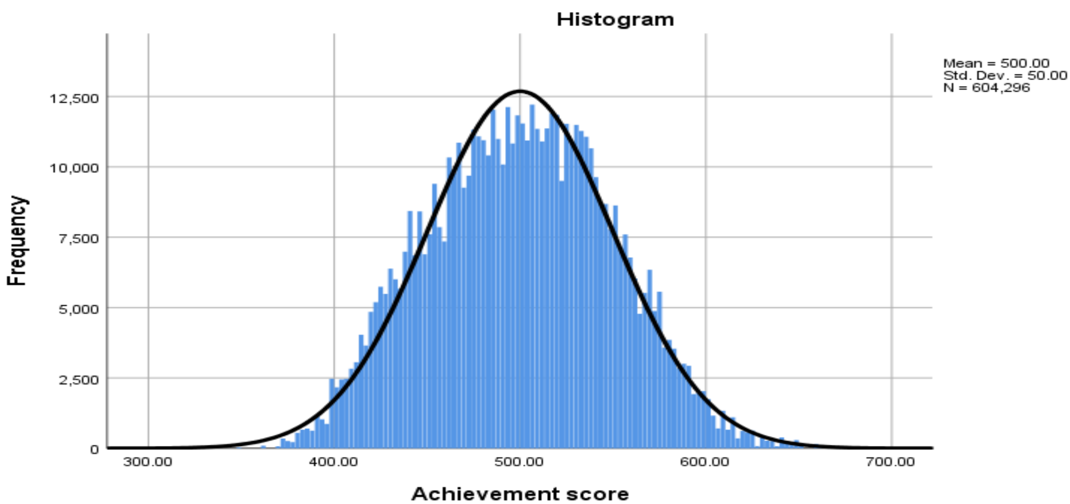

Figure 46 Distribution of achievement score of English

Proficiency level of the students in English

Figure 47 illustrates the distribution of students across different proficiency levels in English. Approximately half of the students (47.4%) were categorized at the basic level, indicating a foundational understanding of the subject. Meanwhile, around two-fifths of the students (40.8%) had achieved the proficient level, demonstrating a solid grasp of English language skills.

In contrast, a relatively small percentage of students fell into the pre-basic and advanced categories. Specifically, 8.1% of students were at the pre-basic level, suggesting they required significant improvement to reach the basic level. Only 3.7% of students had attained the advanced level, showcasing exceptional proficiency in English.

This distribution highlighted the varying degrees of student performance and underscored the need for targeted educational strategies to support students at different proficiency levels. By understanding these patterns, educators can better address the needs of their students and help them progress in their English language skills.

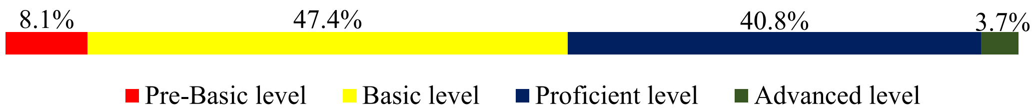

Figure 47 Proficiency level of the students in English at the national level

Mean achievement scores in English by province

Figure 48 provides a comprehensive overview of the average achievement scores in English language across seven provinces, highlighting the variations in educational performance among them. This analysis was crucial for understanding regional disparities and guiding resource allocation to improve educational outcomes in English language.

Bagmati province emerged as the top performer, with an impressive average score of 523.9. This result indicated that students in Bagmati were achieving higher levels of proficiency compared to their peers in other provinces. The strong performance in Bagmati could be attributed to various factors such as better educational infrastructure, more experienced teachers, more educational resources, or effective educational policies.

On the other hand, Karnali province had the lowest average score, with a mean of 473.6. This result suggested that students in Karnali faced significant challenges in achieving the same level of proficiency as those in other provinces. The lower scores in Karnali might be due to factors such as limited access to quality educational resources, socio-economic challenges, or less experienced teaching staff, to name a few.

Koshi and Gandaki provinces also showed commendable performance, with average scores of 510.4 and 511.4, respectively. These scores indicated that students in these provinces were performing well, though not quite at the level of Bagmati. The relatively high scores in Koshi and Gandaki suggested that these provinces had effective educational systems in place, relatively better access to resources than Karnali, but there might still be a room for further improvement.

The findings from Figure 45 underscored the importance of assessing educational performance at the provincial level. By identifying the strengths and weaknesses of each province, policymakers and educators could develop targeted strategies to address specific needs of students. For instance, provinces with lower average scores in English might benefit from increased funding, teacher training programs, or initiatives to improve access to educational resources to support students' learning of English language within and outside classrooms.

Overall, this provincial-level analysis was essential for promoting equitable access to quality education in general and English language in particular. By ensuring that all provinces have the support they need to improve educational outcomes, we can work towards a more balanced and inclusive educational system that benefits all students, regardless of their geographic location.

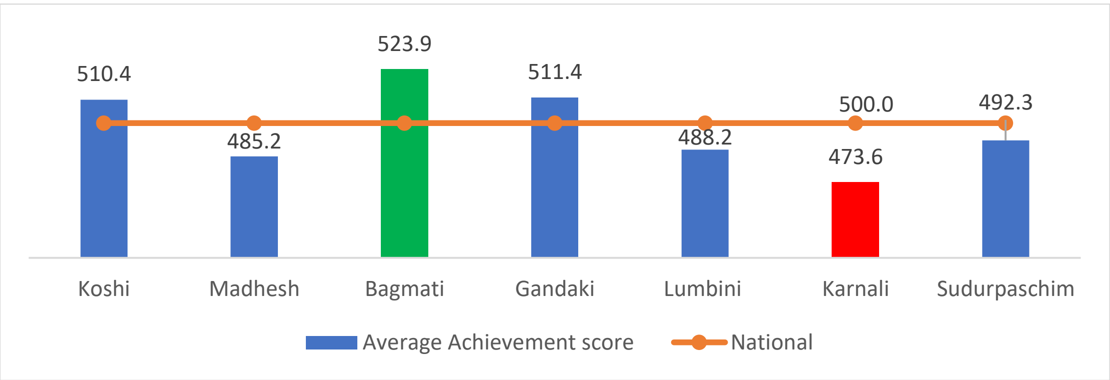

Figure 48 Mean achievement score of students in English by province

Student proficiency in English by province

Student performance was also assessed based on proficiency levels, which varied significantly across different provinces (See Figure 49). The data revealed that Bagmati province excelled with the highest proportion of students achieving Proficient and Advanced levels, at 56.9% and 7.8%, respectively. This indicated strong educational outcomes and effective teaching strategies in Bagmati in the area of English language.

In a stark contrast, Karnali province had the lowest percentages of students reaching these higher proficiency levels, with only 19.3% at the Proficient level and a mere 0.8% at the Advanced level. This result also suggested that students in Karnali faced considerable challenges in attaining higher proficiency, possibly due to factors such as limited resources or less effective educational practices.

Additionally, both Karnali and Madhesh provinces had relatively high percentages of students at the pre-Basic and Basic levels. In Karnali, 13.7% of students were at the pre-Basic level, and 66.2% were at the Basic level. Similarly, in Madhesh, 12.2% of students were at the pre-Basic level, and 55.6% were at the Basic level. These figures highlighted the need for targeted interventions to support students in these provinces and help them progress to higher proficiency levels.

Overall, these findings underscored the importance of evaluating student performance at the provincial levels to identify disparities and allocate resources effectively. By addressing the specific needs of each province, educators and policymakers can work towards ensuring equitable access to quality education for all students.

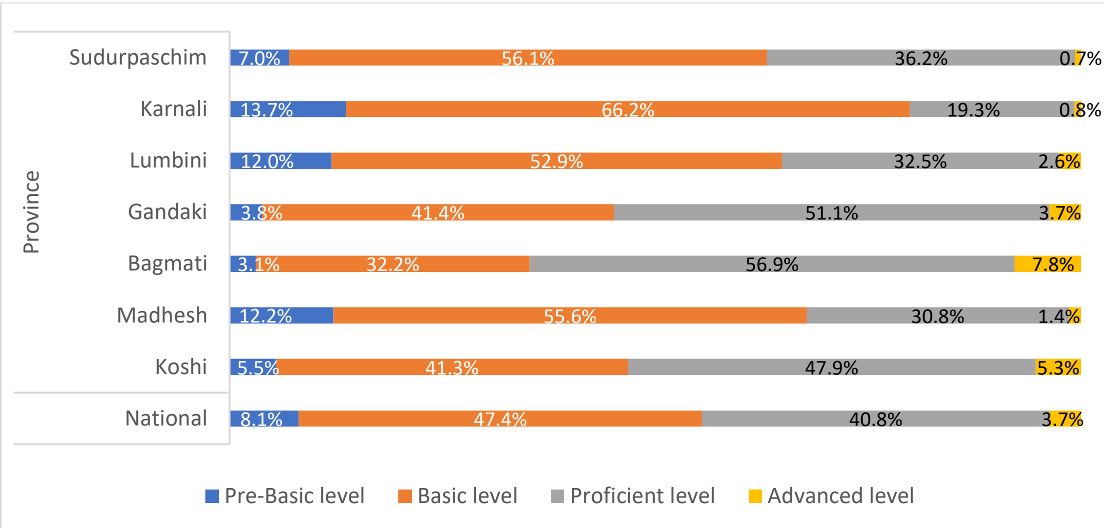

Figure 49 Proficiency level of students in English by province

Mean achievement score in English by local governance units, types of institution and gender

The significant differences in average achievement scores in English across various local governance units, types of institutions, and gender were analyzed using an independent sample t-test. Table 42 revealed several key findings:

Local Governance Units: The average achievement score for students in Urban Municipalities was 509.1 (SD = 50.29), which was significantly higher than the average score of 478.8 (SD = 42.50) for students in Rural Municipalities (Table 42). This result suggested that students in urban areas tended to perform better in English compared to their rural counterparts despite a greater variation, possibly due to better access to educational resources and facilities within school and at home.

Types of Institutions: Students attending institutional (private) schools had a significantly higher average achievement score of 540.5 (SD = 37.04) compared to those in community (public) schools (Mean = 477.60, SD = 41.41) (Table 42), while achievement of community schools had a greater variation than institutional schools. This result indicated that institutional schools might offer more effective teaching methods (mostly in English medium), better learning environments, or additional resources that contributed to higher student performance in English language.

Gender: There was a small variation in achievement scores between boys (Mean = 500.00, SD = 48.97) and girls (Mean = 501.00, SD = 50.99), indicating that gender did not play a major role in determining English proficiency (Table 42). This result suggested that both boys and girls had relatively equal opportunities and capabilities in achieving similar levels of performance in English.

These findings highlighted the importance of considering local context, type of educational institution, and gender when evaluating student performance. By understanding these differences, educators and policymakers can develop targeted strategies to address disparities and improve educational outcomes for all students.

Table 42 Mean achievement score in English by local level, types of institution and gender

Variables	N	Mean	SD	SE	P-value
Local level (n=604296)					
Rural Municipality	181662	478.8	42.50	0.10	0.00
Urban Municipality	422634	509.1	50.23	0.08	
Types of Institution (n=604296)					
Institutional School	214948	540.5	37.04	0.08	0.00
Community School	389348	477.6	41.41	0.07	
Gender (n=593812)					
Boys	295585	500.0	48.97	0.09	0.00
Girls	298227	501.0	50.99	0.09	

Proficiency level in English by local governance units

The proficiency levels of students differed significantly between Rural Municipalities and Urban Municipalities, as illustrated in Figure 50. In Rural Municipalities, a larger proportion of students were at the pre-basic (12.9%) and Basic levels (61.2%). This result indicated that many students in these areas were still developing foundational skills in English.

Conversely, Urban Municipalities showed a higher percentage of students at the Proficient (47.4%) and Advanced levels (5.1%). This suggested that students in urban areas were more likely to achieve higher proficiency levels in English language, reflecting stronger educational outcomes.

These findings highlighted a clear disparity in educational performance between rural and urban areas. While Rural Municipalities had a greater concentration of students at the Basic level, Urban Municipalities tended to excel in helping students reach higher proficiency levels. This disparity underscored the need for targeted educational interventions and resource allocation to support students in rural areas, ensuring they have the opportunities and support needed to achieve higher proficiency in English. By addressing these differences, educators and policymakers can work towards more equitable educational outcomes for all students, regardless of their geographic location.

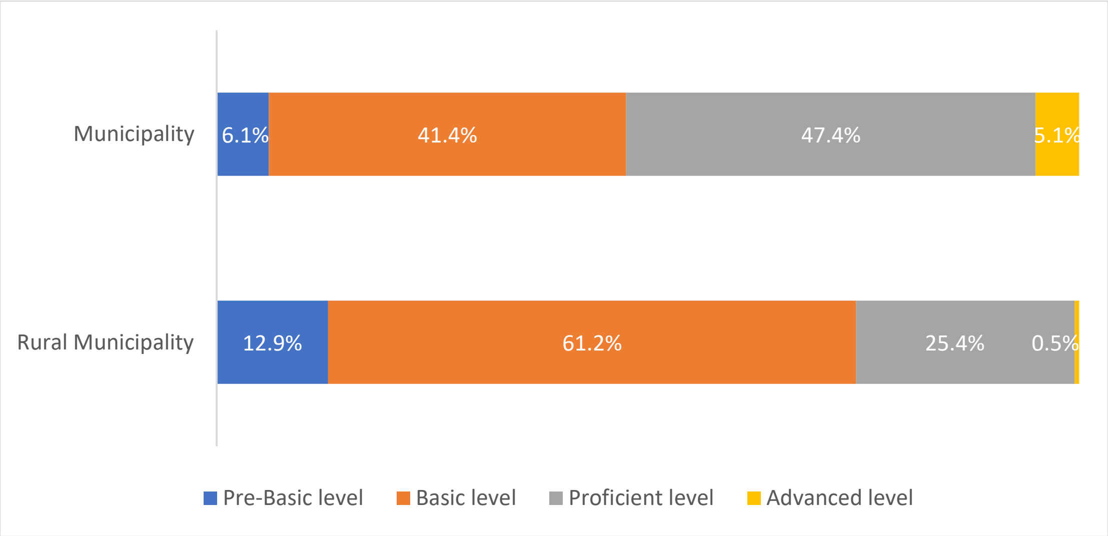

Figure 50 Proficiency level of the students in English by local level

Proficiency level in English by school type

Figure 51 highlights a striking contrast in student performance between institutional (private) and community (public) schools. Specifically, institutional schools had an exceptionally low percentage of students at the pre-basic level, with only 0.2% of students falling into this category. In stark contrast, community schools had a much higher percentage of students at the pre-basic level, at 12.5%. On the other end of the spectrum, institutional schools boasted a significantly higher percentage of students at the advanced level, with 9.9% of their students achieving this status. This was a stark difference compared to community schools, where only 0.3% of students reached the advanced level.

These findings suggested that institutional schools generally achieved higher proficiency levels among their students in English language. This disparity pointed to a potential gap in the quality of education provided by institutional versus community schools in Nepal, indicating that private institutions might offer more effective educational programs, English medium instructions, or resources that better support student achievement in English language.

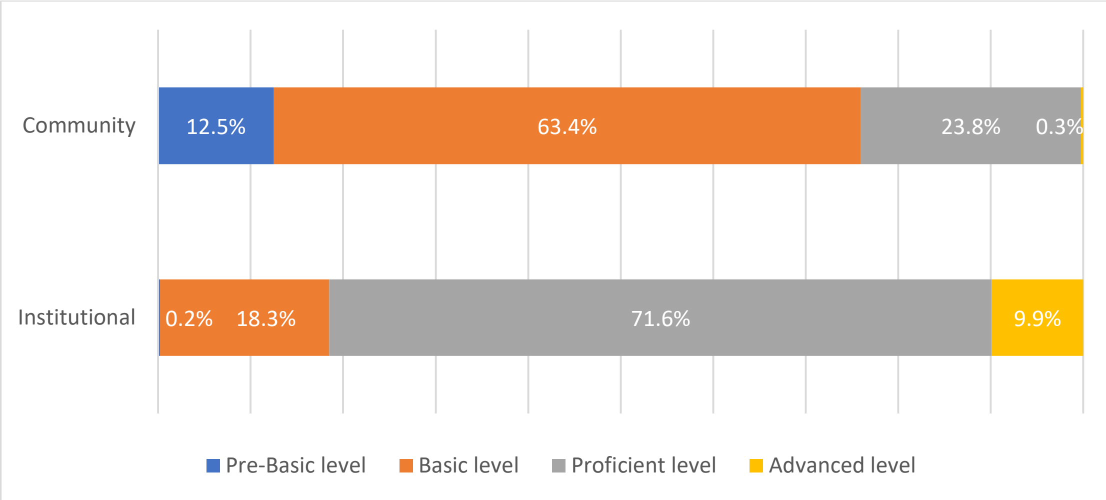

Figure 51 Proficiency level of students in English by school type

Mean achievement score in English by home language, ethnicity, geography and family types

Students whose mother tongue was Nepali tended to achieve significantly higher scores in English language compared to those who spoke other languages, with mean scores of 512.2 (SD = 49.57) versus 485.7 (SD = 46.61), respectively (Table 43). This indicated a notable advantage for Nepali-speaking students in academic performance in English.

Achievement scores also varied significantly across different castes and ethnic groups. Brahmin/Chheetri students had the highest mean score of 515.6 (SD = 48.73), while Dalit students had the lowest mean score of 482.5 (SD = 44.22) (Table 43). This disparity highlighted the influence of caste and ethnicity on academic outcomes in English language.

Additionally, students from the Mountain (Pahadi) community achieved significantly higher scores (Mean = 508.9, SD = 48.89) compared to students from other communities, Himal (Mean = 498.6, SD = 49.56) and Terai (Mean = 499.9, S = 48.55), further emphasizing the role of cultural and regional factors on educational achievement in English language.

Moreover, the family structure appeared to impact student performance. Students from joint families had significantly lower achievement scores (Mean = 499.3, SD = 48.08) compared to their counterparts from nuclear families (Mean = 507.4, SD = 51.24), whereas students from nuclear families also demonstrated a greater degree of variation in their achievement in English than the students from joint families (Table 43). This result suggested that the dynamics and resources available in most of the nuclear families might better support academic success in English language. These findings underscored the complex interplay of language, caste, ethnicity, community, and family structure in shaping students' academic achievements in English language.

Table 43 Mean achievement score in English by home language, ethnicity, geography and family types

Variables	N	Mean	SD	SE	p-value
Home Language (n=604296)					
Other Language	278713	485.7	46.61	0.09	0.00
Nepali Language	325583	512.2	49.57	0.09	
Ethnicity (n=510069)					
Brahmin/Chhetri	198140	515.6	48.73	0.11	0.00
Janajati	185512	503.4	48.39	0.11	
Dalit	60362	482.5	44.22	0.18	
Other Ethnicity	66055	497.2	46.62	0.18	
Geography (n=510069)					
Madheshi (Terai)	205816	499.9	48.55	0.11	0.00
Pahadi (Mountain)	286103	508.9	48.89	0.09	
Himali	18150	498.6	49.56	0.37	
Family Type (n=550042)					
Nuclear Family	227390	507.4	51.24	0.11	0.00
Joint Family	322652	499.3	48.08	0.08	

Mean achievement score in English by parent's education

The education level of parents, specifically mothers (n = 565,816) and fathers (n = 553,965), played a significant role in their children's academic performance. Figure 52 provides a detailed breakdown of students' average achievement scores based on their parents' education levels. The data revealed a clear trend: as the education level of parents increased, so did the average achievement scores of their children.

Students with illiterate mothers and fathers had the lowest average scores, with means of 480.9 and 473.8, respectively. This result suggested that the lack of parental education could be a considerable disadvantage in a child's academic journey, such as learning English language.

Students whose parents had attained higher education levels, such as a Master's degree or beyond, achieved the highest average scores in English language. Specifically, students with mothers holding a Master's degree or higher had an average score of 545.0, while those with fathers at the same education level had an average score of 548.6. This significant difference underscored the positive impact of parents' education on student achievement in English language.

These findings highlighted the crucial role of parents' education in shaping children's academic success in English language, suggesting that higher education levels of parents could provide better support and resources for their children's learning and development.

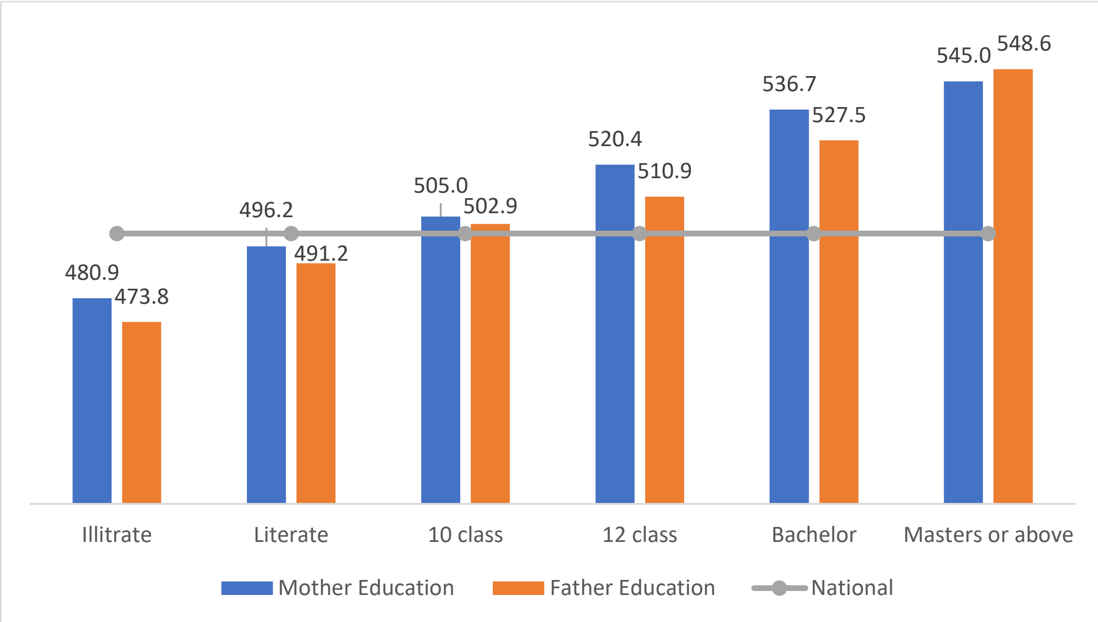

Figure 52 Mean achievement score in English by parent education

Mean achievement score in English by parents' occupation

The results indicated a clear correlation between students' average achievement scores and their parents' occupations, with higher scores linked to professional or skilled jobs. For mothers, those working in teaching and other professional roles had children with the highest average scores in English language, at 531.5 and 531.3, respectively. In contrast, mothers involved in farming and housework had children with the lowest average scores, at 486.1 (Figure 53).

Similarly, fathers' occupations also impacted student performance. Fathers engaged in teaching, business, and other professional roles had children with higher average scores, at 518.4, 522.4, and 521.6, respectively. Conversely, fathers working in farming and housework saw their children achieving lower average scores, at 478.3 (Figure 53).

These findings underscored the academic advantages for students whose parents were in skilled or professional occupations. These results also highlighted the significant influence of socioeconomic status on children's educational performance, suggesting that parents' professional engagement could provide better support and resources for their children's academic success.

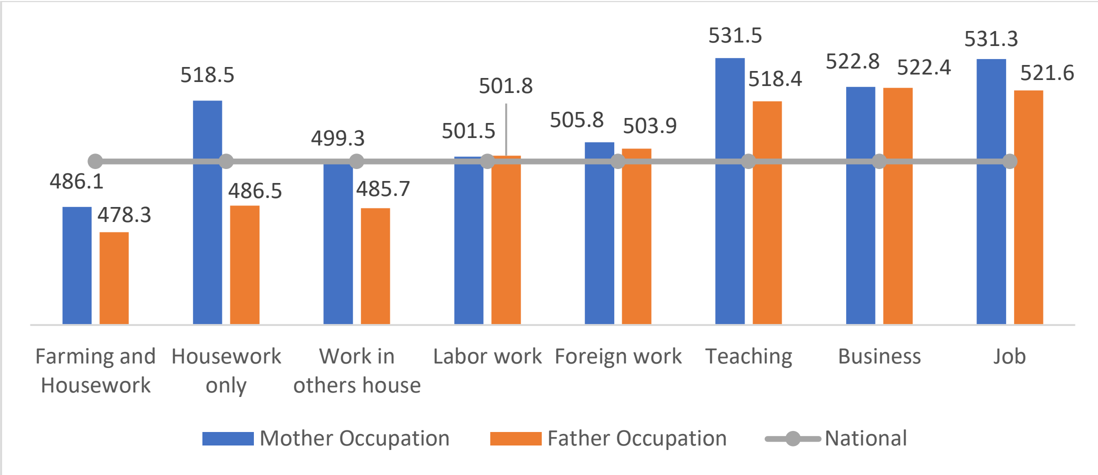

Figure 53 Mean achievement score in English by parent's occupation

Mean achievement score in English based on out of school time

Table 44 illustrates the relationship between students' achievement scores and their time allocation to various activities during the morning and evening on school days. The data revealed some interesting patterns.

On average, students who spent two hours on TV, Internet, or mobile activities achieved a higher mean score of 518.0. In contrast, those who did not engage in these activities had a lower mean score of 490.4 (Table 44). This result suggested that moderate use of digital media might be associated with better academic performance, possibly due to the balanced approach to leisure and study time.

Furthermore, Table 44 showed that students who dedicated more than two hours to studying or doing homework scored significantly higher, with a mean score of 519.8. This result was compared to students who spent less or no time on these academic activities, indicating that increased study time was positively correlated with higher achievement scores. On the other hand, students who played with friends more than two hours had lower achievement (Mean = 499.0) than those who played 1-2 hours (Mean = 508.1) or did not play with their friends (Mean = 501.0). Surprisingly, students who did not spend time on household chorus also achieved lower (Mean = 493.6) compared to those students who spent 1-2 hours (Mean = 508.7). Students who supported siblings for longer hours (more than two hours) had lower achievement in English (Mean = 497.0) than those who supported siblings for shorter time of 1-2 hours (Mean = 510.1) or did not give any time (Mean = 505.8) (Table 44).

These findings highlighted the importance of balanced time management for students. While moderate use of digital media could be beneficial, dedicating ample time to study and homework was crucial for achieving higher academic performance. This result also underscored the need for students to find a healthy balance between leisure activities and their academic responsibilities.

Table 44 Mean achievement scores in English based on spending time out of school

Activities	Mean score based on time spent at home			
	Time not given	< one hour	1-2 hours	>2 hours
TV/Internet/Mobile (n= 512742)	490.4	508.0	518.0	511.1
Play with Friends (n= 508923)	501.0	505.1	508.1	499.0
Household chores (n= 485465)	493.6	508.3	508.7	499.4
Study/homework (n= 480724)	475.5	491.2	515.9	519.8
Support to siblings (n= 276416)	505.8	505.4	510.1	497.0

Mean achievement scores in English by time to reach school

Table 45 presents the English achievement scores of students based on the time it takes them to reach school. The data revealed that students who spent up to half an hour commuting to school had significantly higher achievement scores in English language (Mean = 506.37, SD = 49.30), which were also above the national average of 500. This result suggested that shorter travel times might positively impact students' academic performance in English.

In contrast, students who took longer than half an hour to reach school had notably lower achievement scores, for example those who spent about hour reach school (Mean = 494.8, SD = 74.45), those who spent about two hours (Mean = 481.74, SD = 45.79), and those who spent more than two hours to reach school (Mean = 471.61, SD = 40.74) (Table 45). These results indicated that extended travel times might be detrimental to students' academic outcomes in English language.

Furthermore, post-hoc statistical analysis showed significant differences in mean scores between each category of travel time ($p < 0.01$). These outcomes underscored the importance of considering travel time as a factor in students' academic performance in English, as it appeared to have a measurable impact on their achievement in English.

These findings highlighted the potential benefits of shorter commutes for students, suggesting that reducing travel time could be a strategy to improve academic performance. It also emphasized the need for further research into how travel time affected learning and what measures could be taken to mitigate any negative effects.

Table 45 Mean achievement score in English by time to reach school

Time to reach school	N	Mean	SD	SE	p-value
Up to 15 minutes	352489	506.37	49.30	0.08	
Half hours	119710	503.44	48.60	0.14	0.00
One Hour	60718	494.80	47.45	0.19	

Time to reach school	N	Mean	SD	SE	p-value
Two Hours	22322	481.74	45.79	0.31	
More than two hours	7924	471.61	40.74	0.46	
Total	563164	503.03	49.18	0.07	

Mean achievement scores in English by ECA activities at school

Furthermore, students' achievement scores are found to be influenced by the frequency of Extra-Curricular Activities (ECA) at school and their participation in these activities. The data showed that students in schools where ECAs were conducted occasionally had higher average achievement scores, with a mean of 509.2 (SD = 48.98). This is in contrast to students in schools where ECAs are held regularly, who have a mean score of 493.5 (SD = 48.70), and those in schools with no ECAs, who have a mean score of 491.7 (SD = 48.91) (Table 46).

A similar trend was observed regarding students' participation in ECAs. Students who participated occasionally in ECAs achieved higher scores (Mean = 504.8, SD = 48.41) compared to those who participated regularly (Mean = 500.3, SD = 51.76) or not at all (Mean = 492.2, SD = 45.46). These findings suggested that occasional participation in ECAs was associated with the highest achievement scores.

These findings imply that while ECAs are beneficial, there might be an optimal level of participation that maximizes academic performance. Occasional involvement in ECAs could provide students with a balanced approach, allowing them to benefit from these activities without compromising their academic focus. This highlights the importance of finding a balance between academic responsibilities and extracurricular engagement to support students' overall development and achievement.

Table 46 Mean achievement score in English by ECA activities at school

Categories	ECA frequency at school (n=572196)				Students' participation in ECA at school (n=563309)			
	N	Mean	SD	SE	N	Mean	SD	SE
Regular	256973	493.5	48.70	0.10	216634	500.3	51.76	0.11
Sometimes	304553	509.2	48.98	0.09	310519	504.8	48.41	0.09
Never	10670	491.7	48.91	0.47	36156	492.2	45.46	0.24
p-value	0.00				0.00			

Mean achievement scores in English based on support for study at home

Figure 54 demonstrates the significant impact of different sources of study support on students' average achievement scores. The data revealed that students who received support from their mothers achieved the highest average scores, with a mean of 511.7. Similarly, students who received tuition support also performed exceptionally well, with an average score of 510.7.

These findings suggest that maternal support and tuition are particularly effective in enhancing students' academic performance. The high scores associated with these sources of support indicate that they provide substantial benefits, possibly due to the personalized attention and encouragement they offer.

In comparison, other sources of study support did not appear to have as strong an impact on students' achievement scores. This highlights the crucial role that mothers and tuition play in fostering academic success, emphasizing the importance of targeted and consistent support in students' educational journeys.

Overall, the data underscores the value of maternal involvement and professional tuition in helping students achieve higher academic standards, suggesting that these forms of support are key contributors to their educational outcomes.

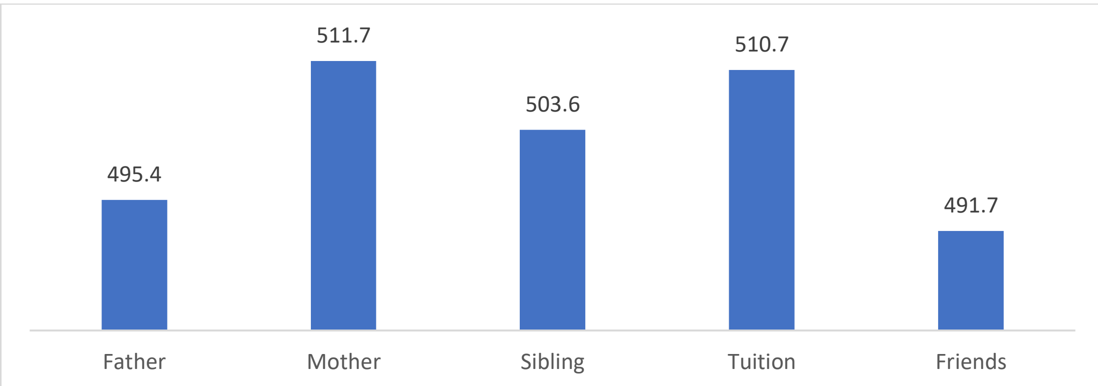

Figure 54 English achievement based on support for study at home

Mean achievement score in English by facilities at home

The findings provide a detailed comparison of students' achievement scores based on their access to various facilities at home, such as television, computer, motorcycle, car, and concrete housing. An overwhelming majority of students (89.6%) reported having access to at least one of these facilities, while a smaller portion (10.4%) indicated they had no access to any of these amenities.

The results revealed a clear trend: students with access to these facilities tend to achieve higher scores compared to those without such access. Specifically, students without access to any facilities at home have a mean achievement score of 480.8 (SD = 42.4). In contrast, those with access to at least one facility have a significantly higher mean score of 502.2 (SD = 50.3) (Table 47).

These results demonstrated that access to facilities at home was positively associated with students' academic performance. The presence of these amenities might provide a more conducive learning environment, offering resources and support that enhanced educational outcomes. These findings highlighted the importance of ensuring that students have access to essential facilities at home to support their academic success.

Table 47 Mean achievement score in English by facilities at home

Access to Facilities	Mean	SD	N
Yes	502.2	50.3	541587
No	480.8	42.4	62709

Achievement scores in English by subject teacher effort in course delivery

The relationship between teacher efforts in course delivery and students' performance in English has been thoroughly examined, revealing a significant impact of teacher effort on students' achievement scores. For example, data shows that students who "sometimes" received homework tended to achieve higher scores (Mean = 508.4) compared to those who "always" received homework (Mean = 499.7) or "never" received homework (Mean = 487.3) (Table 48). This trend suggests that a balanced approach to assigning homework may be more effective.

Additionally, the regularity of teacher efforts played a crucial role. Consistent teacher engagement and regular feedback on homework were also influential. Students who "always" received feedback on their homework achieved higher scores (Mean = 504.1) than those who received feedback "sometimes" (Mean = 497.6) or "never" (Mean = 475.8). This pattern underscores the importance of timely and consistent feedback in enhancing student performance.

Overall, these findings indicate that teacher effort, both in terms of homework assignment and feedback, significantly impacts students' achievement scores in English. This highlights the need for teachers to adopt a balanced and consistent approach to maximize student success.

Table 48 Achievement score in English by subject teacher effort in course delivery

Activities	**Mean Score**		
	Always	**Sometimes**	**Never**
Received Homework	499.7	508.4	487.3
Received Feedback	504.1	497.6	475.8
Teacher Regularity	501.6	511.5	485.8

Mean achievement scores in English based on students' perceptions towards teacher and school

The findings in Table 49 explore how students' perceptions of their school environment and teacher behavior relate to their achievement scores. To gauge these perceptions, students were asked to respond to eight statements about their teachers and four statements about their school environment. Based on their responses, two composite indices were created: one for school environment and one for teacher behavior, each categorized as either positive or negative. Generally, positive perceptions correlate with higher achievement scores.

The results revealed that an overwhelming majority of students (96.0%) have a positive perception of their teachers, while only 4.0% have a negative perception. Similarly, a large majority of students (95.8%) view their school environment positively, with just 4.2% holding a negative view.

Further analysis of mean scores based on students' perceptions of teachers and schools indicated that positive perceptions were associated with higher mean scores. For instance, students with a negative perception of their teachers had a lower mean score of 484.4 (SD = 42.4), whereas those with a positive perception had a higher mean score of 509.3 (SD = 48.7). Similarly, students with a negative perception of their school environment had a mean score of 476.7 (SD = 41.6), while those with a positive perception achieved a mean score of 506.1 (SD = 48.9) (Table 49).

Overall, these findings underscore the importance of fostering positive perceptions of both teachers and school environments to improve student performance outcomes.

Table 49 Mean achievement score in English based on students' perceptions of teacher and school

Variables	Mean	SD	N
Perception Toward Teacher			
Negative	484.4	42.4	18552
Positive	509.3	48.7	442196
Perception Toward School			
Negative	476.7	41.6	22318
Positive	506.1	48.9	506134

Mean achievement scores in English based on the categories under bullying at school

In response to their experiences with bullying at school, only 17.9% of students reported that they have not experienced any form of bullying. In contrast, a quarter of the students (24.5%) indicated that they have experienced some form of bullying (Figure 55). A significant portion of students (57.6%) did not respond to these questions.

Furthermore, the relationship between achievement scores and experiences of bullying was examined. The findings compared achievement scores based on whether students had experienced bullying at school. Generally, students who did not experience bullying tended to have higher achievement scores than those who did (Table 50). Specifically, students who reported experiencing bullying had a slightly lower mean score of 501.7 (SD = 49.9), compared to a mean score of 505.1 (SD = 47.3) for those who did not experience bullying (Table 50). Surprisingly, a considerable number of students (348,027) did not respond to the item related to bullying at school. Their achievement score in English was also low (Mean = 497.7, SD = 50.7). Therefore, cautiousness should be maintained while interpreting the results related to bullying at school.

These results indicated that the absence of bullying was associated with higher mean scores, indicating that a bullying-free environment might have a positive impact on student performance.

Table 50 Mean achievement score in English based on the categories under bullying at school

Variable	Mean	SD	N
No Bullying	505.1	47.3	108282
Bullying	501.7	49.9	147987
Not Responded	497.7	50.7	348027

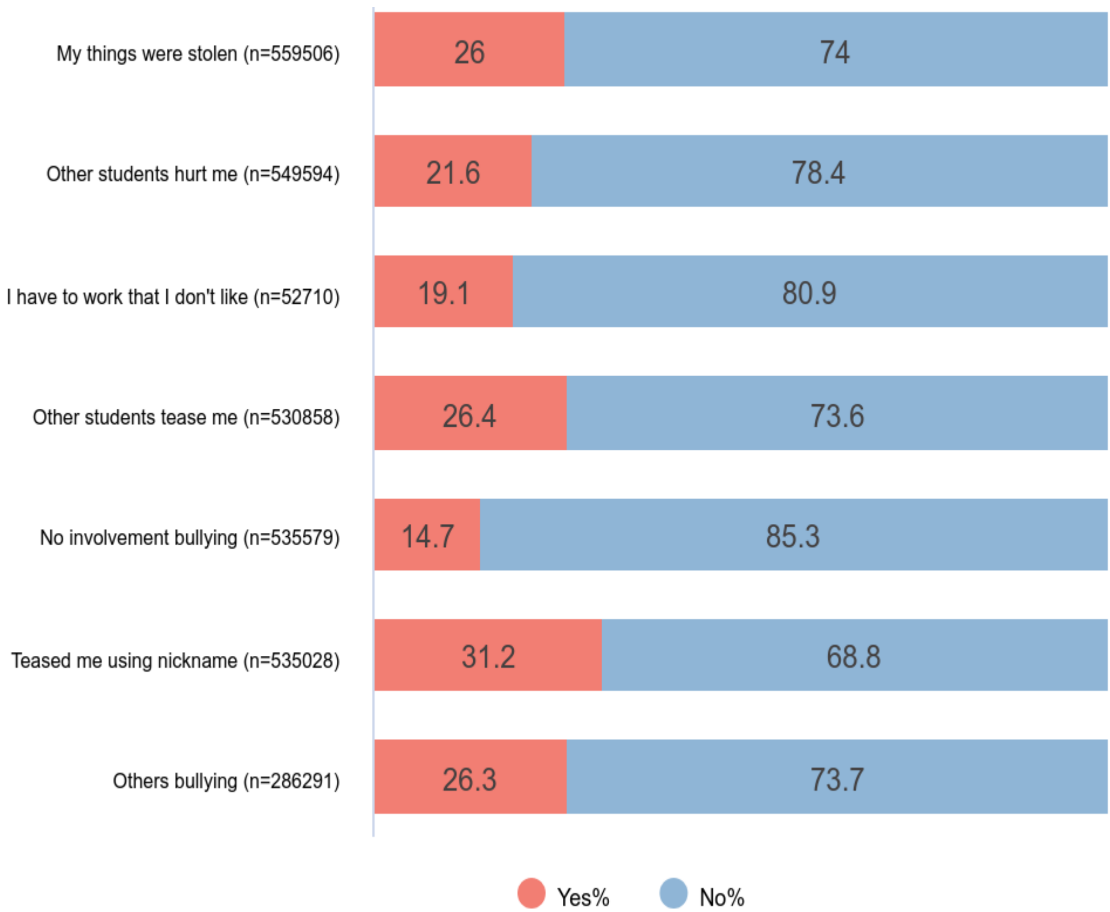

Figure 55 Percentage of students facing bullying in English class

Mean achievement scores in English based on perceptions towards English

In response to the question, the vast majority of students expressed a positive perception towards English, with only about 4.3% indicating negative feelings towards the subject. This data highlighted a generally favorable attitude among students towards learning English.

Moreover, there was a significant correlation between students' perceptions of English and their performance scores. Specifically, students who had a positive outlook on the subject tended to achieve higher mean scores, averaging 505.9 (SD = 48.7), compared to their peers with negative perceptions, who average 470.7 (S D = 41.7) (Table 51). These results suggested that a positive attitude towards English could be linked to better academic performance in the subject.

Table 51 Mean achievement score in English based on perceptions towards English

Perception Toward English Subject	Mean	SD	N
Negative	470.7	41.7	23323
Positive	505.9	48.7	515714

Mean achievement scores in English based on attitude towards English learning

In response to the question, an overwhelming majority of students (94.9%) expressed a positive learning attitude towards English, while a smaller portion (5.1%) indicated a negative attitude towards the subject. This result underscored a generally favorable disposition among students towards learning English.

Furthermore, an analysis of the relationship between students' learning attitudes and their achievement scores revealed significant findings. Students with a positive attitude towards learning English had a notably higher mean score of 506.7 (SD = 49.0), compared to those with a negative attitude, who had a mean score of 482.9 (SD = 44.1) (Table 52). These results clearly indicated that a positive learning attitude towards English was associated with higher academic performance, suggesting that students who were more enthusiastic about learning English tended to achieve better scores.

Table 52 Mean achievement score in English based on attitude towards English learning

Learning Attitude Towards English	Mean	SD	N
Positive	506.7	49.0	488149
Negative	482.9	44.1	26060

Mean achievement scores in English by engagement in subject-related works

Table 53 illustrates the mean scores based on how frequently students engage in English homework. The data revealed that students who never engaged in English homework had the lowest mean score of 474.0 (SD = 45.7). In contrast, those who engaged in English homework during some lessons achieved the highest mean score of 509.2 (SD = 49.3) (Table 53). Students who completed homework in about half of their lessons had a mean score of 501.0 (SD = 48.0).

These findings clearly indicated that regular engagement in English homework was linked to higher mean scores. Notably, the highest mean score was observed among students who did English homework in some lessons. This result suggests that consistent, though not necessarily constant, engagement in homework can lead to the best academic performance in English.

Table 53 Mean achievement score in English by engagement in subject-related works

How frequently do you engage in English homework	Mean	SD	N
Never	474.0	45.7	3177
Some Lessons	509.2	49.3	100129
About Half Lessons	501.0	48.0	265560

Effect of individual, family, and school-related factors on English achievement score

To measure the effects of individual and family factors, as well as perceptions towards school and teachers, on English achievement scores, a regression analysis was conducted. The findings are presented in the table below (Table 54). The first column lists the predictors of the model, the second column shows the unstandardized regression coefficients for each predictor, the third column contains the standard errors, the fourth column provides the standardized regression coefficients, and the last column includes the Variance Inflation Factor (VIF). At the bottom, the effect size of the model, as measured by R-square, is presented.

A positive regression coefficient indicated a positive effect of the predictor on the achievement score, while a negative coefficient indicated a negative effect. The R-square value represented the overall effect size of the model on the achievement score. A VIF value less than 10 suggested the absence of multicollinearity in the model.

The regression model revealed that certain predictors, such as mother's education, study/homework habits, access to facilities at home, and father's education, had a strong positive effect on achievement scores in English. Conversely, predictors like the frequency of extracurricular activities (ECA), time taken to reach school, and working for wages had a negative effect on achievement scores. The VIF values indicated no presence of multicollinearity in the model. The R-square value of 0.355 suggested that approximately 35.5% of the variance in achievement scores was explained by the predictors in this model.

Table 54 Effect of personal, family, and school-related factors on English achievement

Predictors	B	SE	Beta	p-value	VIF
Mother Education	6.60	0.14	0.18	0.00	1.67
Study/Homework	8.59	0.18	0.16	0.00	1.24
Access to Facilities	18.94	0.47	0.13	0.00	1.13
Father Education	4.58	0.14	0.13	0.00	1.64
Teacher Feedback	8.59	0.33	0.08	0.00	1.14
TV/Internet/Mobile	5.57	0.24	0.08	0.00	1.17
Language	6.96	0.31	0.07	0.00	1.12
Learning Attitude Towards English	16.24	0.79	0.07	0.00	1.31
English Teacher Classroom Regularity	5.29	0.28	0.06	0.00	1.16
Perception Toward English Subject	14.38	0.89	0.06	0.00	1.49
ECA Participation	4.16	0.26	0.05	0.00	1.12
Family Type	4.13	0.30	0.04	0.00	1.07
Perception Toward Teacher	5.36	0.83	0.02	0.00	1.36
Perception Toward School	5.41	0.96	0.02	0.00	1.43
Play with Friends	0.00	0.23	0.00	1.00	1.16
Support to Siblings	-1.63	0.19	-0.03	0.00	1.13
Household Chores	-2.13	0.19	-0.04	0.00	1.12
Teacher Homework	-3.51	0.30	-0.04	0.00	1.16
Bullying	-4.26	0.30	-0.05	0.00	1.09
Engaged in Homework	-4.93	0.31	-0.05	0.00	1.06
Teacher Regularity	-4.46	0.28	-0.05	0.00	1.17
English Textbook	-8.56	0.49	-0.05	0.00	1.05
ECA Frequency	-7.01	0.29	-0.08	0.00	1.14
Time to reach School	-6.63	0.17	-0.12	0.00	1.04
Work for Wages	-8.53	0.22	-0.13	0.00	1.13

CHAPTER EIGHT

Findings, Conclusions and Recommendations

Findings and Discussion

The average achievement score in Mathematics for 2022 was calibrated using the average score of students from 2018. This calibration revealed a learning loss, with comparing the 2022 achievement score as 484.6. This decline can be attributed to the disruptions caused by the COVID-19 pandemic. The PISA results also indicated a learning loss in tenth-grade students post-pandemic (OECD, 2023a). The pandemic led to widespread school closures and a sudden shift to remote learning, which posed various challenges. Many students struggled to adapt to online education due to factors such as lack of access to technology, limited internet connectivity, and insufficient support for effective remote instruction (Joshi et al., 2024). The decline in academic performance in Mathematics underscores the need for targeted interventions to address and mitigate the pandemic's impact on students' learning outcomes.

Regarding students' proficiency levels, in Mathematics more than 75% were at pre-basic and basic levels, similar to the results from NASA 2018, which showed 72% at these levels (NASA, 2018). Only 21% of students achieved 62% of the tested curriculum, and a mere 1% achieved 96% of the tested curriculum. This indicates that the majority of students struggle with basic mathematical operations and number writing (NASA, 2018). Additionally, the PISA report highlights comparatively poor proficiency among students in developing and underdeveloped countries compared to those in developed countries (OECD, 2023a).

The average achievement score in Nepali for 2022 was also calibrated based on the 2018 average scores, showing similar results between the two years. However, no national assessment test was conducted in 2018 for Science and Technology and English subjects. Therefore, the national achievement score for Science and Technology and English is set at 500, serving as a benchmark for comparison. The proficiency levels of students in English and Science and Technology revealed that most students fall into the basic and proficient levels, with 88.2% and 92.7%, respectively.

Results with Province Level

The province-level achievement scores in Mathematics revealed that four provinces Koshi, Madhesh, Bagmati, and Gandaki met the national achievement level. Among these, students from Gandaki Province achieved the highest average score in 2022, whereas students' from Madhesh Province had the highest score in NASA 2018. In contrast, students from Karnali province had the lowest average score in 2022, followed by Sudurpaschim, while students from Lumbini had the lowest score in 2018.

In terms of proficiency, students from Madhesh Province had the highest percentage of students at the advanced level, while the other provinces had less than one percent of students at this level. Most students across all provinces were at the basic level.

In Science and Technology, students from Bagmati, Gandaki, and Koshi provinces surpassed the national average score, with students from Bagmati achieving the highest score and Madhesh Province the lowest. Students from Bagmati Province also had the highest level of advanced proficiency in Science and Technology, while students from Gandaki province had the highest overall proficiency.

Similar patterns were observed in Nepali and English subjects, with students from Bagmati, Gandaki, and Koshi provinces meeting the national average score. Students from Bagmati Province scored the highest in Nepali, while students from Sudurpaschim had the lowest score in 2022. However, in 2018, students from Gandaki had the highest score and Karnali the lowest. In English, students from Bagmati Province led with the highest achievement score, while students from Karnali had the lowest.

The ANOVA and Post-Hoc results confirmed a statistically significant relationship between students' scores across all provinces in all subjects. This analysis highlighted the varying levels of academic achievement and proficiency across different provinces, emphasizing the need for targeted educational interventions to address these disparities.

Results with Local Governance Units

Students from Urban areas, encompassing urban municipalities, sub-metropolitan, and metropolitan cities, have achieved significantly higher mean scores across all subjects compared to students from Rural Municipalities. Urban Municipalities met the national achievement score, whereas Rural Municipalities fell slightly below the national average. This disparity was particularly pronounced in Science and Technology, where urban areas exhibited notably higher scores than their rural counterparts.

In terms of proficiency, less than 25% of students in both urban and rural areas reached the proficient level. The proficiency levels in other categories, such as basic and advanced, appeared quite similar between the two localities. These patterns were consistent across subjects, including Nepali and English, highlighting a broader trend of higher academic performance in urban areas compared to rural ones. These results underscored the need for targeted educational interventions to bridge the gap between urban and rural student performance.

Results with School Types

The achievement scores of institutional schools were notably higher compared to their community school counterparts. However, in 2018, the performance gap between the two types of schools was minimal, indicating similar results. Furthermore, there had been a slight decline in achievement scores for both institutional and community schools in subjects such as Nepali and Mathematics. This trend suggested a need for targeted interventions to address the areas of decline and improve overall academic performance.

Results with Gender

In the subject of Mathematics, gender differences revealed that boys tended to achieve higher scores compared to girls. Conversely, in subjects such as Science and Technology, Nepali, and English, girls outperformed boys significantly. Interestingly, this pattern of results remained consistent in 2018 for both Mathematics and Nepali, indicating that the gender-based performance trends in these subjects had been stable over time. This result emphasized the need for a deeper understanding of the factors contributing to these differences and the development of strategies to support balanced academic achievement across all subjects.

Results with Home Language

Students whose mother tongue was Nepali tended to have significantly higher mean scores across all four subjects compared to those who spoke other languages at home. However, the results from the NASA 2018 assessment indicated a different trend in Mathematics, where students who spoke other languages at home outperformed their Nepali-speaking peers. This suggested that while Nepali-speaking students generally excelled academically, there were specific areas, such as Mathematics, where students from other linguistic backgrounds might have an advantage. This finding highlighted the importance of considering linguistic diversity when developing educational strategies and support systems.

Results with Ethnicity

While analyzing the academic performance of different ethnic groups across all four subjects, Brahmin/Chhetri students consistently achieved the highest scores. They were followed by students categorized as 'Others,' who also performed well but not as high as the Brahmin/Chhetri group. Next in line were the Janajati students, whose scores were moderate in comparison. At the lower end of the spectrum were the Dalit students, who had the lowest mean scores among the groups. This pattern underscored the disparities in educational outcomes among various ethnic groups, highlighting the need for targeted interventions to support underperforming groups and promote educational equity.

Results with Regions

When examining regional achievement scores in Mathematics and Science and Technology, Terai (Madhesi) students stood out with the highest scores, significantly surpassing those of Mountain (Pahadi) and Himali students. This indicated a strong performance in these subjects among Terai students. However, the trend shifted when it came to Nepali and English. In these subjects, Mountain students achieved the highest scores, demonstrating their proficiency. On the other hand, Terai students had the lowest scores in Nepali and English, highlighting a disparity in performance across different subjects. This variation underscored the importance of addressing regional educational needs and tailoring support to help all students excel across all subjects.

Results with Family Types

Across all subjects, students from nuclear families consistently achieved higher mean scores compared to their peers from joint families. This trend suggested that the family structure might play a significant role in academic performance. Students in nuclear families might benefit from more focused parental attention and resources, which could contribute to their higher achievement levels. Conversely, students from joint families, who might share resources and attention among a larger group, faced challenges that impact their academic outcomes. Understanding these dynamics could help educators and policymakers develop strategies to support students from different family backgrounds and ensure equitable educational opportunities for all.

Results with Time to Reach School

In all the subjects of Mathematics, Science and Technology, Nepali, and English, students who had the shortest travel time to school (up to 15 minutes) consistently achieved the highest scores. In contrast, those with travel times exceeding two hours tended to have the lowest scores in these subjects. This pattern suggested that longer travel times might negatively impact academic performance, possibly due to factors such as fatigue, reduced study time, and less engagement in school activities. Understanding these dynamics is crucial for developing strategies to mitigate the negative effects of long travel times and to support students' academic success across all subjects.

Results with Medium of Instruction (Science and Technology and Mathematics)

In Mathematics, students attending schools where a local language (other than Nepali or English) was used as the medium of instruction achieved significantly higher scores compared to those in schools using Nepali or English as the medium of instruction. This result suggested that learning in their native language might enhance students' understanding and performance in Mathematics. However, the trend shifted when it came to Science and Technology. In this subject, students who were instructed in English achieved the highest scores, surpassing the national average. These students performed significantly better in Science and Technology than their peers instructed in other languages. This result indicated that English-medium instruction might provide an advantage in understanding and excelling in Science and Technology, possibly due to the availability of resources and materials in English, and many Science and Technology terminologies are from English. This contrast highlights the importance of considering the medium of instruction's impact on different subjects and tailoring educational strategies to maximize student achievement.

Results with Out of School Time

In Mathematics and Science and Technology, students who moderately engaged in activities such as studying and doing homework, and who limited their time spent on less productive activities like using digital resources to 1-4 hours, achieved higher scores. In contrast, those who spent more than four hours on these less productive activities tended to have the lowest achievement scores in these subjects.

When it comes to playing with friends, students who engaged in this activity for less than one hour or between one to two hours achieved significantly higher scores than the students who spent more than four hours playing with friends. Similarly, in Nepali, students who moderately engaged in study and homework and limited their time on less productive activities, such as using digital resources, achieved the highest scores. Those who spent more time on such activities and gadgets tend to score lower.

In English, students who spent an average of two hours on digital resources achieve higher scores compared to those who did not spend time on these activities. Additionally, students who devoted more than four hours to studying and homework scored even higher compared to those who spent less time on these academic activities. This pattern highlighted the importance of balanced engagement in productive activities and the need to limit time spent on less productive ones to optimize academic performance across various subjects.

Results with School Engagement

The study investigated the impact of school engagement activities on students' achievement scores across various subjects. It revealed that in Mathematics and Science and Technology, students who engaged in group work during their leisure time and those who occasionally participated in extracurricular activities (ECA) tended to achieve higher scores. Regular participants in ECA also performed well, indicating the benefits of these activities.

In Science and Technology, students who had no leisure time achieved the highest scores, followed by those who focused primarily on classwork and homework. A similar trend was observed in Nepali, where students with no leisure time attained the highest scores.

In English, students who occasionally participated in ECA outperformed both regular participants and non-participants. Schools that offered occasional ECA activities saw higher student achievement in this subject.

Overall, the study highlighted that occasional participation in extracurricular activities was associated with higher achievement scores across all subjects. This outcome suggests that a balanced approach to school engagement, combining academic focus with occasional extracurricular involvement, can enhance students' academic performance.

Results with Parents' Education

In all subjects, the education level of parents played a crucial role in determining students' academic achievement. The results showed a clear trend: the higher the parents' education, the better the students perform across all subjects. Despite this, there were still significant challenges. Approximately one-fourth of mothers were illiterate, and one-fifth were only had basic literacy. Similarly, around 13% of fathers were illiterate, and 18% were simply literate.

The NASA 2018 assessment further supported these findings, showing that students with highly educated parents achieved better scores in all subjects assessed. These findings underline the importance of parents' education in shaping children's academic success and highlighted the need for initiatives to improve adult literacy and education, which in turn can positively impact the next generation's educational outcomes.

Results with Parents' Occupations

Students whose parents were engaged in labour work or household work tended to display the lowest levels of achievement scores in all four subjects. This was particularly concerning given that around half of the parents fell into these occupational categories. In contrast, students whose parents were employed as teachers exhibited significantly higher achievement scores across all subjects. This trend was also observed in the NASA 2018 assessment, which reported similar results. These results highlight the impact of parental occupation on students' academic performance, suggesting that the educational environment and support provided by parents in teaching professions may contribute to their children's higher achievement levels. This underscores the need for targeted support and resources for students whose parents are in labour-intensive or household work to help bridge the achievement gap.

Results with Student Support for Study

In Mathematics, students who did not receive any study support achieved the highest scores, closely followed by those who received tuition. Interestingly, students who relied on support from friends had the lowest scores in this subject. These results suggested that independent study or professional tutoring could be more effective for Mathematics achievement. Student dependent on friends could be detrimental as it could limit their ability to learn from self-practice or supervised problem-solving.

In Science and Technology, student performance varied based on the type of study support received. Students who received support from parents, siblings, and friends managed to meet the national achievement score, while those without any support fell short of this benchmark. Notably, students who received support from their mothers achieved the highest scores in Science and Technology. This indicates the significant positive impact of parental involvement, particularly from mothers, on students' Science and Technology performance.

A similar trend was observed in English, where students who received support from their mothers achieved higher scores compared to those who did not receive such support. This pattern underscores the crucial role of parental support, especially mothers' involvement in enhancing students' academic performance across different subjects. It highlights the importance of encouraging and facilitating parental engagement in their children's education to help them achieve better academic outcomes.

Results with Home Facilities

The study delved into the impact of various home facilities on students' achievement scores. It considered the availability of resources such as the internet, dictionaries, reference books, literature books, computers, a peaceful study environment, separate rooms, and study tables. The results revealed a clear dependency of students' achievement scores in Mathematics and Science and Technology on the presence of these home facilities. Specifically, students with dedicated study spaces and access to computers scored significantly higher than those lacking such amenities.

The findings were significant across all variables except for literature books, indicating that the availability of home resources generally favored higher achievement scores. This trend was consistent in Nepali subjects, where students with access to computers and mobile devices outperformed their peers without these resources.

Similarly, in English, students with access to service facilities achieved higher scores compared to those without. Additionally, students with internet access at home had higher average scores than those without internet access. Overall, the study underscores the importance of a well-equipped home environment in enhancing students' academic performance across various subjects.

Results with Teacher Activities

Students' self-reported attitudes towards their teachers' activities revealed a significant correlation between attitude and academic achievement. Specifically, students who held a positive attitude towards their teachers tended to achieve higher academic success compared to those with a negative attitude. This suggests that a constructive and appreciative perspective on teachers' efforts can enhance students' performance, highlighting the importance of fostering positive student-teacher relationships in educational settings.

Results with Student Perceptions towards Learning

Those students having positive attitudes towards learning Science and Technology, Mathematics, Nepali, and English had higher achievement score than those having negative attitudes.

Results with Bullying Activities

Those students facing any types of bullying had significantly poor achievement score in all subjects. However, up to one-third students faced some types of bullying at their school and classroom that impacted their learning and performance in all subjects.

Results with School Environment

Those students having positive attitude towards school environment had better academic performance as compared to having negative attitude.

Results with Student Motivation towards Subjects

Those students having positive attitude towards the subjects as Science and Technology, Mathematics, Nepali, and English had significantly higher achievement scores than those having negative attitude.

Results with Student Engagement

Those students who regularly engaged in different learning activities had significantly higher achievement score in all subjects as compared to the students who never or some time engaged in learning activities.

Conclusion

The educational landscape in Nepal was marked by significant disparities in student achievement scores, which were influenced by a variety of factors. Provincial differences were evident, with regions like Gandaki, Bagmati, and Koshi outshining others, suggesting a need for more support in underperforming areas. The urban-rural divide was also pronounced, with urban students achieving higher scores, pointing to possible discrepancies in resource allocation. Institutional schools had a clear advantage over community schools, and language mastery, particularly in Nepali, was a key determinant of academic success. Gender analysis revealed that girls performed better in subjects other than Mathematics, and ethnic as well as regional disparities suggested that cultural and socioeconomic factors played a role in educational outcomes.

Moreover, family dynamics and commute times to school were significant, with students from nuclear families and those with shorter travel times excelled academically. English medium instruction correlated with higher scores in Science and Technology and Mathematics, indicating the benefits of English proficiency.

Lastly, a balanced approach to extracurricular activities, including moderate screen time, was associated with better academic performance. These insights underscore the need for a holistic approach to education in Nepal, one that addresses the multifaceted challenges students face and promotes equal opportunities for all, regardless of their socio-economic, cultural, ethnic, family, or geographic background. Engagement in extracurricular activities (ECA) and the educational background of parents emerged as significant contributors to higher achievement scores across subjects. Students who balanced ECA with their studies tended to perform better, particularly in English and Mathematics. The correlation between parents' education and students' performance was evident, with children of parents holding higher degrees, especially in teaching, achieved the best results. This trend underscores the impact of an academically conducive home environment on student success.

Furthermore, support systems, both at home and school, played a crucial role. Students receiving support from family members, particularly mothers and siblings, tended to meet or exceed national achievement scores. Access to technology, such as computers and the internet, also correlated with higher achievement, highlighting the importance of digital resources in modern education. Positive perceptions of teachers and a supportive school environment, and free from bullying, were associated with better student performance. Motivation and engagement in learning activities were key with motivated students and those actively participating in lessons, especially in group work and creative tasks, achieving higher scores.

These findings suggest that a holistic approach to education, which includes parental involvement, resource availability, positive school dynamics, and motivation, is essential for enhancing student achievement in Nepal.

Recommendations

Provincial Level

The province wise achievement score established that some provinces consistently outperformed others, while certain regions faced challenges. By allocating additional resources to underperforming provinces, we can address disparities in low performance and achievement in all subjects. This may include investing in infrastructure, resources, teacher training, and learning materials. For provinces like Karnali, which scored below the national average in multiple subjects, targeted educational interventions could be implemented to improve student outcomes. This could include additional resources, teacher training, and after-school programs. Considering the lower scores in Nepali and English in some provinces, a focus on language skills development is crucial. This may involve language immersion programs, reading clubs, and enhanced language curriculum, to name a few. It is recommended that investment in educational infrastructure and training, especially in underperforming provinces, should be increased to ensure that all students have access to a conducive learning environment.

Local Governance Units

To bridge the urban-rural municipality gap in education and ensure equitable opportunities for all students in Nepal, it is essential to invest in rural education infrastructure and teacher training. In rural areas, inadequate infrastructure, transportation barriers, and a shortage of qualified teachers may hinder educational access. By allocating resources to build and maintain school facilities, providing teacher capacity building programs, and promoting multilingual education, student learning outcomes can be enhanced. Community involvement, awareness campaigns, and a holistic approach that addresses physical infrastructure, human resources, and curriculum are crucial steps toward achieving quality education in rural regions. Adoption of technology should be done to bridge the educational divide, such as through distance learning programs and digital libraries. Improvement of school infrastructure in rural municipalities, such as building libraries and Science and Technology labs, provides a better learning environment. Locating more educational resources to rural municipalities to bridge the gap in achievement scores. This could include books, technology, and access to online learning platforms. Adequate investment in professional development for teachers in rural municipality could help in enhancing their teaching skills, particularly in subjects where students were underperforming.

School Types

Study showed that community schools were underperforming as compared to institutions schools. Therefore, strengthening community schools in Nepal need a multifaceted approach. First, assess Science and Technology and Mathematics teachers' efficiency in enhancing students' learning through qualitative and quantitative research methods. Second, empower local communities by aligning national policies with local needs and promoting community participation. Third, raise awareness among teachers about collaborative teaching strategies. Finally, focus on capacity building, stakeholder engagement, and effective school characteristics to create a more equitable educational site for all students.

Gender

Develop initiatives to support girls in Mathematics and encourage boys in other subjects to balance gender performance. To encourage gender equality in education in Nepal, the government and public together can implement targeted initiatives. These include girl-focused social protection programs, and safe learning environments. By challenging traditional perceptions and fostering an inclusive environment, can help create a brighter future for all students.

Language

Implementation of additional language support programs should be done for students whose mother tongue is not Nepali. This could include after-school tutoring, Nepali language club, language workshops, and the integration of language skills development into the curriculum. Exploring the possibility of bilingual education models that allow students to learn in both Nepali and their home language can help increase the achievement of students in the respective subjects. This approach can help bridge the gap in academic performance across different subjects. Moreover, providing professional development opportunity for teachers to equip them with strategies to support multilingual learners would be beneficial to make effective classroom. This includes training in culturally responsive teaching methods and assessment techniques that are fair to non-native speakers. Advocating for educational policies that recognize and support the linguistic diversity of students would be beneficial. This includes lobbying for funding and resources dedicated to multilingual education programs, for those provinces where there is language barrier in student learning and development.

Ethnicity

Develop targeted educational programs to support groups that are lagging, particularly the Dalit students, to bridge the achievement gap in subjects like Mathematicss, Nepali, and English. Ensure the curriculum is culturally inclusive and sensitive to the diverse backgrounds of students, which may help in improving engagement and performance, especially in language subjects. Provide additional training for teachers to address the diverse learning needs of students from different ethnic backgrounds and to employ teaching methods that are equitable and effective for all groups. Allocate resources equitably to schools with higher populations of underperforming groups to ensure they have access to quality educational materials and support. Engage with communities and parents from underrepresented groups to encourage involvement in their children's education and to understand better the challenges they face. Finally, conduct further research to understand the underlying factors contributing to the achievement gaps and to develop evidence-based solutions.

Region

Ensure that educational resources are distributed equitably across regions, with a focus on areas where students are underperforming, such as the Himali region in Mathematics and Science and Technology. Local Educational officer should be trained with the knowledge and skill that can help cater to the specific needs and cultural contexts of the Terai (Madhesi), Mountain (Pahadi), and Himali students to improve performance in all subjects. Given the varying scores in Nepali and English, provide additional language support to students, especially where they are performing below the regional average. Focus on strengthening the curriculum and teaching methods in Science and Technology and Mathematics, particularly in regions where students are performing below the average. Train educators in cultural competence to better understand and address the diverse backgrounds and needs of students from different regions. Increase community involvement in education, particularly in regions where students are underperforming, to build a supportive environment for learning. Encourage collaboration between schools from different regions to share best practices and resources, this can be done by educational tour of teachers to those schools which are performing best in subjects like Mathematics and Science and Technology.

Time to Reach School

To address the challenge of long commutes for students in Nepal, we can explore two key strategies. First, by improving road infrastructure and investing in reliable public transportation services, we can reduce travel time and ensure safer commuting. Second, establishing local educational centres, such as Community Learning Centers (CLCs), closer to students' homes will enhance access to education and create hubs for learning within communities.

Out of School Time

Encourage students to adopt a balanced study routine, where moderate engagement in study/homework is paired with limited leisure activities. Advise parents and educators to limit students' screen time on TV, Internet, and mobile devices to 1-2 hours per day, as this is associated with higher scores in Mathematics and Science and Technology. Support students in engaging in physical activities and playing with friends for less than one hour or 1-2 hours, which is linked to higher achievement scores. Help students structure their leisure time to include productive activities that can complement their learning, such as educational games or reading. Integrate educational technology that can make the 1-2 hours of screen time more productive and aligned with educational goals. Schools should consider homework policies that align with these findings, ensuring that students have adequate time for both study and rest. Provide guidance to parents on how to monitor and structure their children's study and leisure time effectively. Conduct further research adopting both quantitative and qualitative approaches to understand the impact of different types of leisure activities on academic performance and to develop more nuanced recommendations.

School Engagement

Schools should integrate group work into their curriculum, especially in Mathematics and Science and Technology, as it correlates with higher achievement scores. Students who participate in Extra-Curricular Activities (ECA) occasionally tend to have higher achievement scores. Schools should aim for a balanced schedule that allows for occasional ECA participation without overwhelming students. For subjects like Science and Technology and Nepali, students who spend more time on classwork and homework, or have less leisure time, tend to score higher. Schools might consider structured academic support for students outside of regular school hours. Since students who participate in ECAs occasionally perform better, schools should consider offering ECAs on a less frequent, more intensive basis rather than regular sessions.

While regular participation in ECAs is associated with higher achievement, there is room for improvement. Schools should provide additional academic support to regular ECA participants to help them achieve their full potential. Recognize that students have different needs and preferences. Schools should assess the individual needs of students and tailor their engagement activities accordingly. Further research is needed to understand the causal relationships between ECA participation and academic achievement, and to develop strategies that can be implemented at a national level. Policymakers should consider these findings when designing educational policies and programs, ensuring that they promote a balanced approach to academics and extracurricular engagement.

Parents' Education

Schools should develop programs that encourage parental involvement in their children's education, which could include workshops or seminars on effective home study strategies. Strengthen communication channels between schools and homes to ensure parents are well-informed about their children's progress and how they can support learning at home. Involve parents with higher educational backgrounds in school activities, such as guest lectures or career talks, to enrich the educational experience of all students. For students whose parents have lower educational attainment, schools could provide additional support such as tutoring or mentoring programs. Share the findings with policymakers to advocate for educational policies that support family engagement and recognize the role of parents' education in student achievement. Collaborate with local community organizations to create a supportive ecosystem that values education and provides learning opportunities for both parents and students. Regularly monitor the impact of these initiatives and adjust strategies based on what is most effective in improving student achievement.

Parents' Occupations

Schools should create programs that allow parents who are teachers to share their expertise, potentially through workshops or after-school programs. Develop targeted support programs for students whose parents are engaged in labour work, such as additional tutoring or mentorship opportunities. Offer career counselling for parents to explore opportunities for professional advancement, which may indirectly benefit their children's academic performance. Establish partnerships with local businesses and professionals to provide real-world learning experiences and support for students. Introduce students to role models from various occupational backgrounds to inspire and motivate them, regardless of their parents' professions. Conduct further research to understand the mechanisms by which parents' occupations affect student achievement and how schools can best support all students. Advocate for policies that address the educational needs of children from diverse occupational backgrounds, ensuring equitable opportunities for academic success.

Support for Study

Encourage students to develop independent study habits, as those without any support tend to score the highest in Mathematics and Nepali. Highlight the importance of parental support, especially from mothers, as it is associated with higher achievement scores in Science and Technology and English. Assess the effectiveness of tuition, as it appears to be beneficial but not as much as independent study or parental support. Recognize that students benefit from different types of support and provide a range of study support options. Address the lower scores associated with friend-supported study by training students in effective peer tutoring methods. Government of Nepal should develop a policy about study support programme which may help increase the achievement of struggling students. There should be clear provisions for implementation of such policy which may really work to address the issues of the students. Policy should more focus on engaging the community to create a supportive environment for students, including after-school programs and study groups.

Home Facilities

Encourage parents to create a study space at home, as students with such facilities tend to achieve higher scores. Facilitate access to computer and the internet for students at least at school, as these resources are associated with higher achievement scores. Schools should collaborate with local libraries or community centres to provide students with access necessary learning resources. Advocate for the creation of peaceful study areas in or near students' homes through community initiative. Offer guidance to parents on the importance of a separate room or table for study, emphasizing how these facilities contribute to their children's success. Integrate the use of technology into the school curriculum, so students can make the most of these resources at home.

Teacher Activities

Teachers should maintain good manners and act as positive role models, as this is linked to higher student achievement. Creating a supportive learning environment by minimizing scolding and punishment also correlates with better scores. Training teachers to treat all students equitably and with care can improve performance, and responsiveness to student inquiries is crucial for higher achievement. Full-time engagement in teaching duties leads to marginally higher scores. Regular homework assignments with constructive feedback are essential, especially in Mathematics, where they significantly impact achievement. Teacher attendance and regularity are vital, particularly in Mathematics and Nepali, where consistent attendance is associated with the highest scores. Homework and feedback practices should be adapted to each subject; for example, in English, a flexible approach to homework may be more beneficial.

Student Perceptions of Teachers

Encourage teachers to maintain good manners and a caring approach in teaching, as these traits are associated with higher student achievement scores. Develop professional development programs that provide teachers with alternative disciplinary strategies, reducing the need for scolding and physical punishment. Encourage teachers to be responsive to students' questions, as this is positively correlated with student achievement. Maintain consistent homework practices, as agreeing with regular homework is associated with higher scores. Ensure that teachers check homework regularly and provide constructive feedback, as this consistency is reflected in stable achievement scores. Address the discrepancy in Mathematics where students who disagree with positive teacher traits score higher, perhaps indicating a need for a more nuanced understanding of student-teacher dynamics.

Student Experience of Bullying

Train teachers to foster respect, empathy, and kindness among students. Conduct workshops on positive classroom management and conflict resolution. Additionally, implement clear anti-bullying policies within schools, addressing all forms of bullying, including cyberbullying. Educate teachers, students, and parents about the importance of preventing bullying through awareness campaigns. By investing in teacher training and anti-bullying measures, schools can create a safe and supportive environment where students thrive academically and emotionally.

Student Motivation Towards Learning

The motivational factor found to be crucial for higher achievement of the students, therefore further research and subject specific interventions need to be performed to increase the motivation of the students. To enhance student motivation and engagement in Nepal, educators should implement a multifaceted approach. First, create motivational programs that encourage goal-setting, provide constructive feedback, and offer students choices. Second, adopt interactive teaching methods such as active learning, varied classroom structures, and clear expectations. By combining these strategies, educators can create a vibrant learning environment that fosters student curiosity, participation, and interest.

Student Attitude Towards Learning

Schools should create a positive learning environment by praising effort, recognizing achievements, and supporting struggling students. Educators should provide personalized support and teaching strategies to improve achievement scores. Confidence-building programs, such as goal-setting and self-assessment, should be integrated into the curriculum. Engaging activities like interactive lessons and educational games should be regular in classrooms. Schools should offer extracurricular clubs, advanced classes, and real-world applications of subjects. Regular assessments of students' attitudes can identify those needing extra support. Parents should be encouraged to engage in their children's learning, and teachers should receive training to promote positive attitudes in the classroom.

Student Engagement in Learning

Encouraging students to participate in group work, creative writing, and debate/speech activities can lead to higher scores in Mathematics. Surprisingly, students who start their homework in class and those who never do exercises or solve problems score higher, suggesting a need to re-evaluate homework approaches. Providing class time for these activities allows for immediate support and feedback, improving understanding and performance. Schools should offer various extracurricular options without over-scheduling students. In Nepali and English, frequent engagement in exercises, group work, and asking questions correlates with higher scores. Teachers should design lesson plans that require active participation and engagement in every class or at least half of the classes. Making lessons engaging and relevant to students' interests fosters enjoyment and higher achievement. Group work in English is most effective when used selectively, so teachers should monitor and adjust its frequency. Addressing students' perceptions of difficulty by offering support, simplifying complex topics, and celebrating small victories can improve performance.

By addressing these areas, Nepal can work towards a more equitable and effective educational system that supports all students in achieving their full potential. In addition, past recommendations of ERO's studies on NASA should be assessed in terms their impact on policies and practices at one hand, and teacher and school accountability measures on the other hand.

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